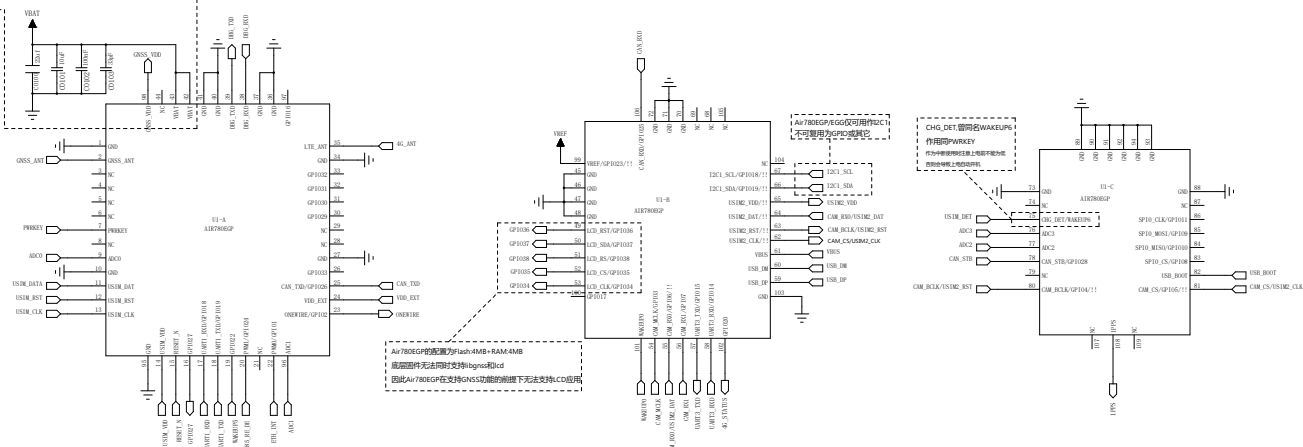


REVISION RECORD			
LTR	ECO NO:	APPROVED:	DATE:

Air780EGP参考设计

- 1.VBAT电压输入范围为3.3V~4.3V
- 2.建议VBAT的PCB走线尽量短且足够宽，宽度不少于1.2mm
- 3.电容焊件按照容值从小到大的顺序靠近模组VBAT管脚排列



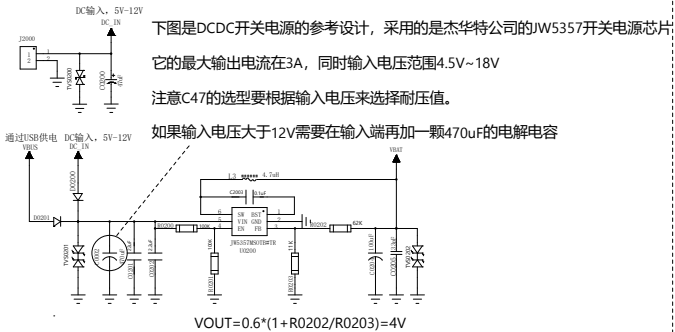
特别提醒！

- 1,仅Air780EGG和Air780EGH支持Audio功能;
- 2,Air780EGG相对Air780EGH新增内置了G-Sensor,可协助抑制静态飘逸/低功耗控制;
- 3,Air780EGP虽然也内置了G-Sensor,但是不支持Audio功能,不能驱动Audio Codec;
- 4,如果选择Air780EGH,需要外置G-Sensor以协助抑制静态飘逸和低功耗控制;
- 5,优先推荐选择Air780EGP(Flash:4MB+RAM:4MB)或Air780EGG(Flash:8MB+RAM:8MB);

		COMPANY: 合宙LuatOS			
		TITLE: Air780EGP开发板			
DESIGN: ZhuPinjun	DATE: 2025-5-8				
DESIGNED: laolu	DATE: 2025-5-8	CODE: laolu	SIZE: A1	DRAWING NO: 2025-11-11	REV: 4
QUALITY CONTROL: laolu	DATE: 2025-5-8				
RELEASED: laolu	DATE: 2025-5-8	SCALE: G			SHEET: 1 of 14

REVISION RECORD			
REV	REV NO.	APPROVED:	DATE

DC-DC 方案



COMPANY: 合宙LuatOS

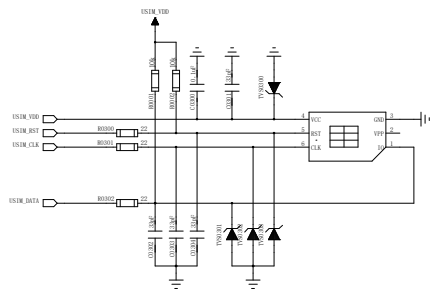
TITLE: Air780EGP开发板

DESIGN: ZhuPingJun	DATE: 2025-5-8
CHECKED: laolu	DATE: 2025-5-8
QUALITY CONTROL: laolu	DATE: 2025-5-8
RELEASED: laolu	DATE: 2025-5-8

CODE	SIZE	DRAWING NO.	REV.
laolu	A1	2025-11-11	4

REVISION RECORD			
LINE	REV NO.	APPROVED:	DATE

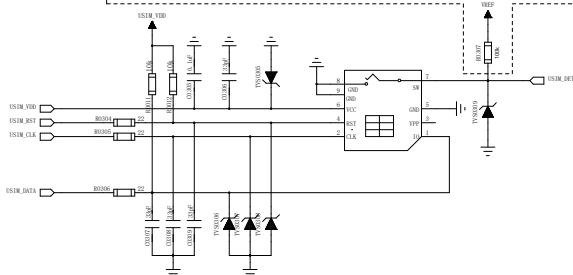
6-PIN SIM1接口参考电路



- 1.SIM卡座与模块距离摆件不能太远，越近越好，尽量保证SIM卡信号线布线不超过20cm；
- 2.SIM卡信号线布线远离RF线和VBAT电源线；
- 3.为了防止可能存在的USIM_CLK信号对USIM_DATA信号的串扰，两者布线不要太靠近，在两条走线之间增加地屏蔽。
且对USIM_RST_N信号也需要地保护；
- 4.为了保证良好的ESD保护，建议加TVS管，并靠近SIM卡座摆放。选择的ESD器件寄生电容不大于50pF。
在模块和SIM卡之间也可以串联22欧姆的电阻用以抑制杂散EMI，增强ESD防护。
SIM卡的外围电路必须尽量靠近SIM卡座。

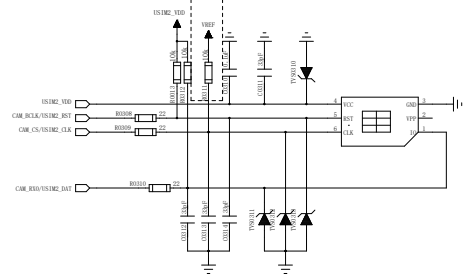
带检测PIN SIM1卡座参考电路

USIM_DET一般默认使用WAKEUP2信号(PIN79:USIM_DET)，
在WAKEUP2被内部占用的型号中比如Air780EGP/EGG，
也可以使用PIN75:CHG_DET等其它中断信号做SIM卡插入检测信号。



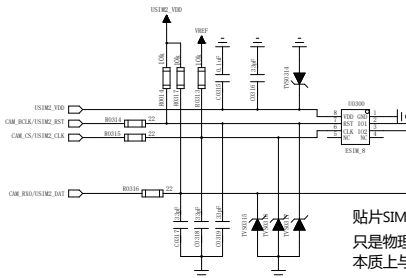
6-PIN SIM2接口参考电路

SIM2_CLK需要上拉至Vref，以保证SIM2_CLK在Stop状态下保持高电平
SIM_CLK在Stop状态下保持高电平是SIM卡规范的要求



- 1.如果需要使用SIM2，需要注意！
SIM2，无论电源还是信号(CLK/DATA/RST)，均为复用模组的其它管脚；
当使用SIM2通道时，模组的PIN55/PIN80/PIN81三个管脚需必悬空；
PIN55/PIN80/PIN81的默认功能是SPI Camera，这意味着使用SIM2便无法使用Camera；
- 2.在我们的描述中，有时候使用SIM0 vs SIM1，有时候使用SIM1 vs SIM2，请大家灵活理解；
- 3.插拔卡和贴片SIM卡没有本质区别，只是物理介质不同，Air780Exx系列都可以支持；

SIM2贴片SIM卡参考电路

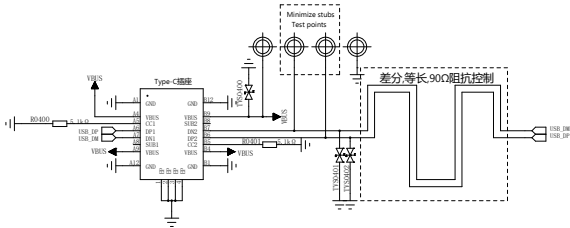


贴片SIM卡，也常称为ESIM
只是物理表现形式上与插拔卡不同
本质上与插拔卡没有任何区别
合宙全系4G模组都支持ESIM

DESIGN:		COMPANY:		合宙LuatOS			
DRAWN:		TITLE:		Air780EGP开发板			
DESIGNED:	laolu	DATE:	2025-5-8	CHECK:	laolu	SIZE:	A1
QUALITY CONTROL:	laolu	DATE:	2025-5-8	DESIGNING NO.:	2025-11-11	REV.:	4
RELEASED:	laolu	DATE:	2025-5-8	SCALE:	G	SHEET:	3 of 14

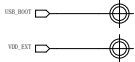
REVISION RECORD			
LV	REV NO.	APPROVED:	DATE

USB

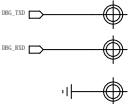


- 1.USB走线需要严格按照差分线控制，做到平行和等长；
- 2.USB走线的阻抗需要控制到差分90欧姆；
- 3.需要尽可能的减少USB走线的stubs，减少信号反射；USB信号的测试点最好直接放在走线上以减少stub
- 4.在靠近USB连接器或者测试点的地方添加TVS保护管，由于USB的速率较高，需保证选用的TVS保护管的寄生电容小于1pF
- 5.VBUS作为USB插入检测，必须连接USB电源或者外接电源，否则USB无法被检测到，VBUS的检测电压要大于3.3V

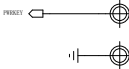
测试点



USB_BOOT 在开机过程中拉高可以进入USB下载模式
建议预留测试点



DGB_UART，也常备称为UART0，用作底层日志的抓取
波特率921600bps，不可更改
不可作为通用UART使用



开机键测试点，设计批量升级夹具时会用到



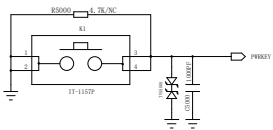
VBAT供电测试点，设计批量升级夹具时会用到

DESIGN:		DATE:		COMPANY:			
ZhuPingJun		2025-5-8		合街LutOS			
CHECKED:		DATE:		TITLE:			
laolu		2025-5-8		Air780EGP开发板			
QUALITY CONTROL:		DATE:		COD:	SIZE:	DRAWING NO:	REV:
laolu		2025-5-8		laolu	A1	2025-11-11	4
RELEASED:		DATE:		SCALE: G			
laolu		2025-5-8		SHEET: 4 of 14			

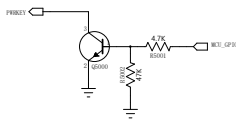
REVISION RECORD			
LV	REV NO.	APPROVED:	DATE

开机PWRKEY/复位RESET/下载BOOT/WAKEUP

按键开机

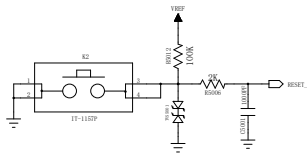


单片机控制开机

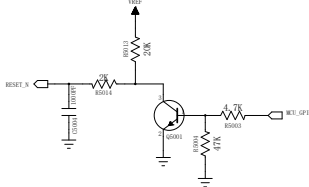


- 1.把PWRKEY管脚拉低0.5s后开机，开机成功后PWRKEY管脚可以释放。
- 2.按键附近需放置一个TVS管用作ESD防护。
- 3.PWRKEY 的电压域是VBAT，如果用单片机控制开机的话需要加一个三极管。
- 4.可以通过一颗不超过10KΩ的电阻直接将PWRKEY拉低，实现上电自动开机。

RESET_N 复位

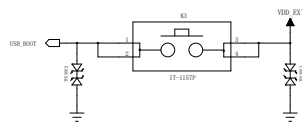


单片机控制重启



- 1.拉低 RESET_N 引脚 0.5S 可使模块复位。
- 2.RESET_N信号对干扰比较敏感，因此建议在模块接口板上的走线应尽可能的短，且需包地处理。
- 3.RESET_N 的电压域是模组芯片内部LDO_1.8V,实测电压在1.3V以上都为正常,如果用单片机控制重启的话需要加一个三极管。

USB下载使能



同时按下开机键和BOOT键,然后再上电,即可通过USB下载软件;

		COMPANY: 合宙LuatOS					
		TITLE: Air780EGP开发板					
DESIGN:	ZhuPingJun	DATE:	2025-5-8				
CHECKED:	laolu	DATE:	2025-5-8				
QUALITY CONTROL:	laolu	DATE:	2025-5-8				
RELEASED:	laolu	DATE:	2025-5-8				
			CORE:	SIZE:	DRAWING NO:		REV:
			laolu	A1	2025-11-11		4
			SCALE: G			SHEET: 5 of 14	

REVISION RECORD			
LV	REV NO.	APPROVED:	DATE

ADC参考电路

1.四路对外ADC,分辨率12bit;

2.分压电阻请选用1%精密电阻。阻值要高(10K级以上)，减少耗流及避免灌电。

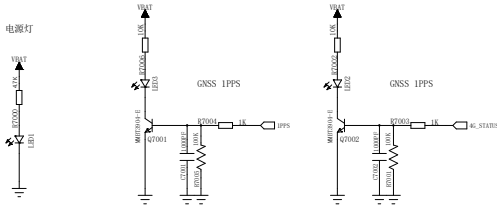
3.模块的VBAT管脚内部也连接到了ADC，可以读取VBAT管脚的电压。

4.更多介绍 <https://docs.openluat.com/air780epm/product/air780exxpins/>

				COMPANY: 合宙LuatOS			
				TITLE: Air780EGP开发板			
DESIGN: ZhuPingJun	DATE: 2025-5-8						
DRAWN: laolu	DATE: 2025-5-8	CORE: laolu	SIZE: A1	DRAWING NO: 2025-11-11		REV: 4	
QUALITY CONTROL: laolu	DATE: 2025-5-8						
RELEASED: laolu	DATE: 2025-5-8	SCALE: G			SHEET: 6 OF 14		

REVISION RECORD			
REV	REV NO.	APPROVED:	DATE

LED状态灯

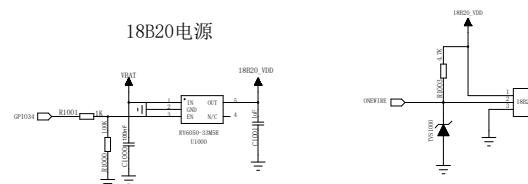


两种典型状态灯, 大家根据实际需要增加或减少.
低功耗工作模式下, LED的功耗往往是被忽略的耗电大户, 请特别注意!

DRAWN:		DATE:		COMPANY:			
ZhuPingJun		2025-5-8		合宙LuatOS			
CHECKED:		DATE:		TITLE:			
laolu		2025-5-8		Air780EGP开发板			
QUALITY CONTROL:		DATE:		CORE:	SIZE:	DRAWING NO.:	REV:
laolu		2025-5-8		laolu	A1	2025-11-11	4
RELEASED:		DATE:		SCALE: G			
laolu		2025-5-8		SHEET: 7 of 14			

REVISION RECORD			
LTR	ECO NO:	APPROVED:	DATE:

ONEWIRE



更多信息 <https://docs.openluat.com/air780epm/product/air780exxpins/>

		COMPANY:		合宙LuatOS	
		TITLE:		Air780EGP开发板	
DESIGN:	ZhuFangjun	DATE:	2025-5-8		
DESIGN:	laolu	DATE:	2025-5-8		
QUALITY CONTROL:	laolu	DATE:	2025-5-8		
RELEASE:	laolu	DATE:	2025-5-8		
		CODE:	SIZE:	DRAWING NO:	REV:
		laolu	AI	2025-11-11	4
SCALE: G				SHEET: 8	OF 14

REVISION RECORD			
LV	REV NO	APP/REVISED	DATE

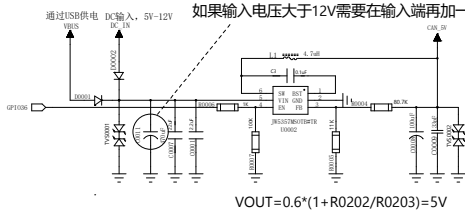
CAN 收发器 5V 电源

下图降压DCDC方案，与系统供电一样使用的是杰华特JW5357

CAN收发器供电电压范围4.5V-5.5V，典型值5V

注意C47的选型要根据输入电压来选择耐压值

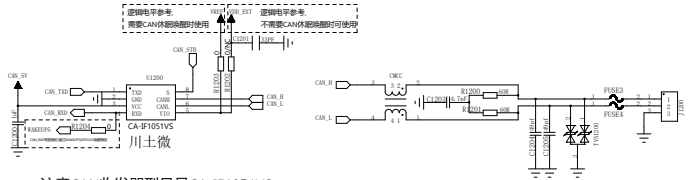
如果输入电压大于12V需要在输入端再加一颗470uf的电解电容



$VOUT = 0.6 * (1 + R0202/R0203) = 5V$

DC_IN或VBUS输入范围在4.5V-5.5V之间时，也可以使用DC_IN或VBUS为CAN收发器供电

CAN接口



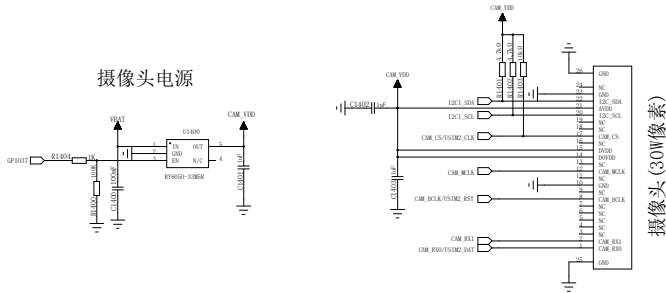
注意CAN收发器型号是CA-IF1051VS
不是CA-IF1051S,切勿弄混

1,CMCC,共模扼流圈,推荐型号共模扼流线圈ACT45B-101-2P;
2,TVSS1200,推荐型号PESD1CAN;

COMPANY: 合宙LuatOS			
TITLE: Air780EGP开发板			
DESIGN: ZhuPingJun	DATE: 2025-5-8	DRAWING NO:	
CHECKED: laolu	DATE: 2025-5-8	REV:	
QUALITY CONTROL: laolu	DATE: 2025-5-8	2025-11-11	
RELEASED: laolu	DATE: 2025-5-8	4	

REVISION RECORD			
LINE	REV NO.	APPROVED:	DATE:

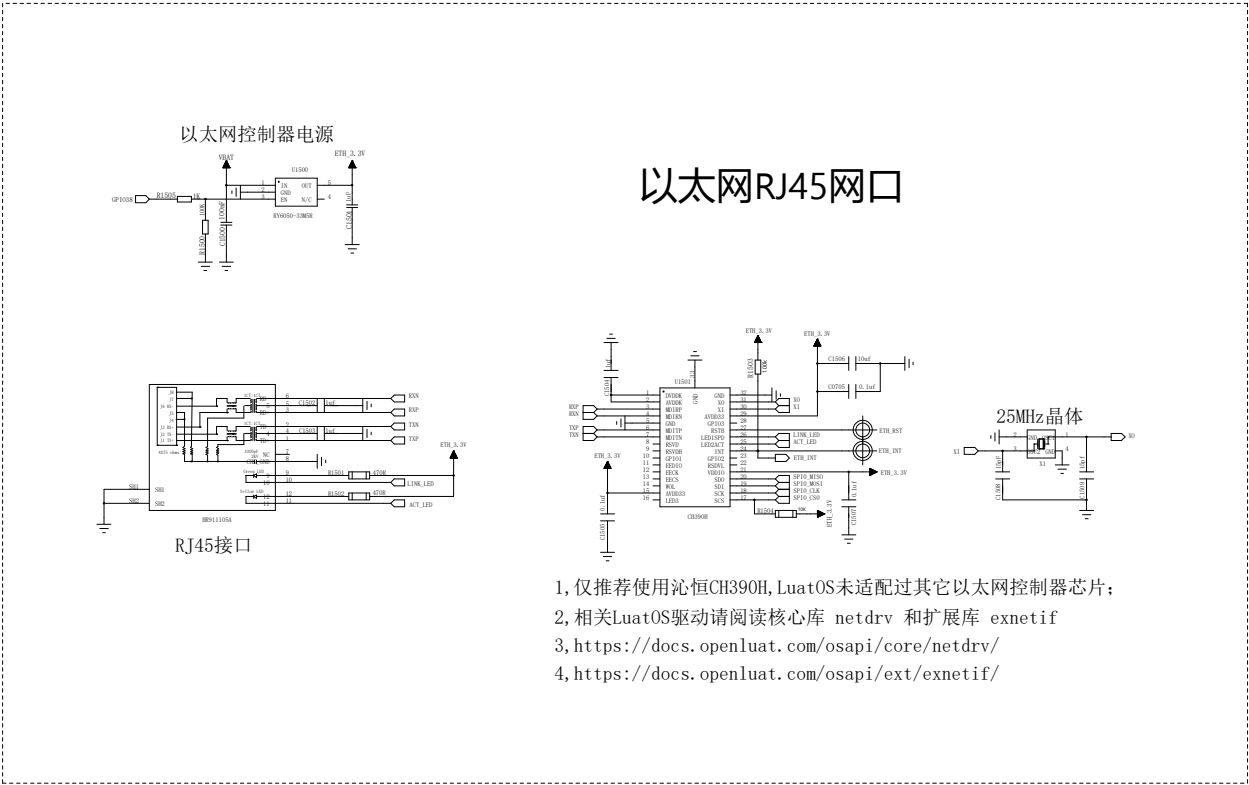
Camera 30W像素



- 1,本参考设计适用于合宙配件AirCAMERA_1040/AirCAMERA_1050,官方淘宝店 Luat.taobao.com 有售;
- 2,CAM_CS/CAM_BCLK/CAM_RX0与USIM2本质是主芯片的同一个IO引到了不同的两处管脚,注意二者不可同时使用;
- 3,AirCAMERA_1040的驱动IC为GC032A,AirCAMERA_1050的驱动IC是GC0310,调试时请注意;

DESIGN:		DATE:		COMPANY:			
ZhuPingJun		2025-5-8		合宙LuatOS			
CHECKED:		DATE:		TITLE:			
laolu		2025-5-8		Air780EGP开发板			
QUALITY CONTROL:		DATE:		CORE:	SIZE:	DRAWING NO.:	REV:
laolu		2025-5-8		laolu	A1	2025-11-11	4
RELEASED:		DATE:		SCALE: G			
laolu		2025-5-8		SHEET: 1 of 14			

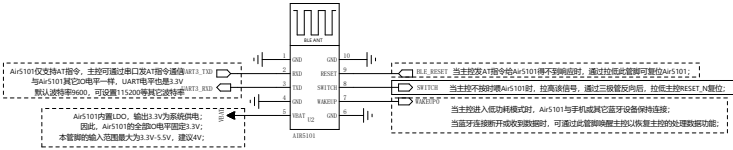
REVISION RECORD			
LINE	REV NO.	APPROVED:	DATE



		COMPANY:		合宙LuatOS			
		TITLE:		Air780EGP开发板			
DESIGN:	ZhuPingJun	DATE:	2025-5-8				
CHECKED:	laolu	DATE:	2025-5-8	CODE:	SIZE:	DRAWING NO.:	REV.:
QUALITY CONTROL:	laolu	DATE:	2025-5-8	laolu	A1	2025-11-11	4
RELEASED:	laolu	DATE:	2025-5-8	SCALE: G			SHEET: 12 th 14

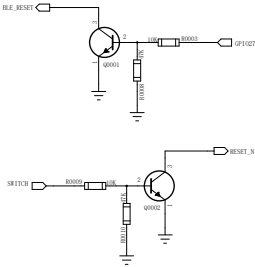
REVISION RECORD			
LTW	REV. NO.	APPROVED:	DATE:

BLE 5.2模组Air5101



更多资料

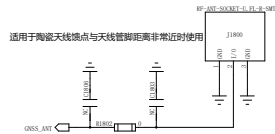
<https://docs.openluat.com/air5101/product/shouce/>



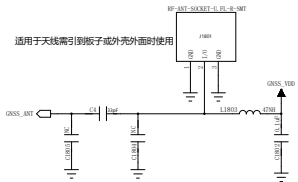
合宙LuatOS			
Air780EGP开发板			
DESIGN:	ZhuPingJun	DATE:	2025-5-8
CHECKED:	laolu	DATE:	2025-5-8
QUALITY CONTROL:	laolu	DATE:	2025-5-8
RELEASED:	laolu	DATE:	2025-5-8
SCALE:	G	SHEET:	13/ 14

REVISION RECORD			
LV	REV NO.	APP/REVISED	DATE

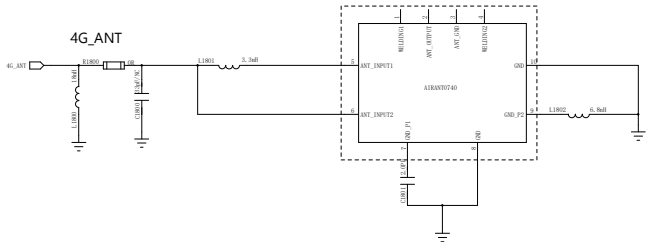
GNSS无源天线



GNSS有源天线



4G天线



- 1,本参考设计使用的是合宙贴片式PCB天线,AirANT4073,尺寸40*7*3mm;
- 2,合宙还有多款尺寸不同、封装各异的贴片式PCB天线可供选择;
- 3,匹配电路已调试好,PCB封装(含匹配电路)已做成标准封装,欢迎咨询;

COMPANY: 合宙LuatOS			
TITLE: Air780EGP开发板			
DESIGN: ZhuPingJun	DATE: 2025-5-8	CODE: A1	
CHECKED: laolu	DATE: 2025-5-8	SIZE: 14* 14	
QUALITY CONTROL: laolu	DATE: 2025-5-8	DRAWING NO: 2025-11-11	
RELEASED: laolu	DATE: 2025-5-8	REV: 4	