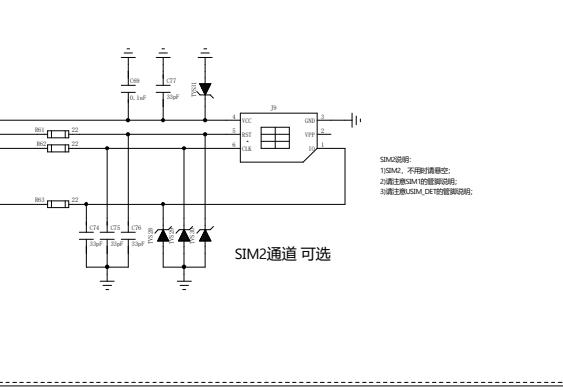
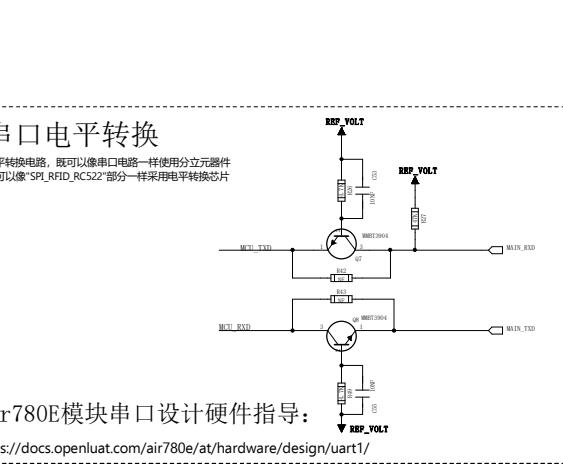
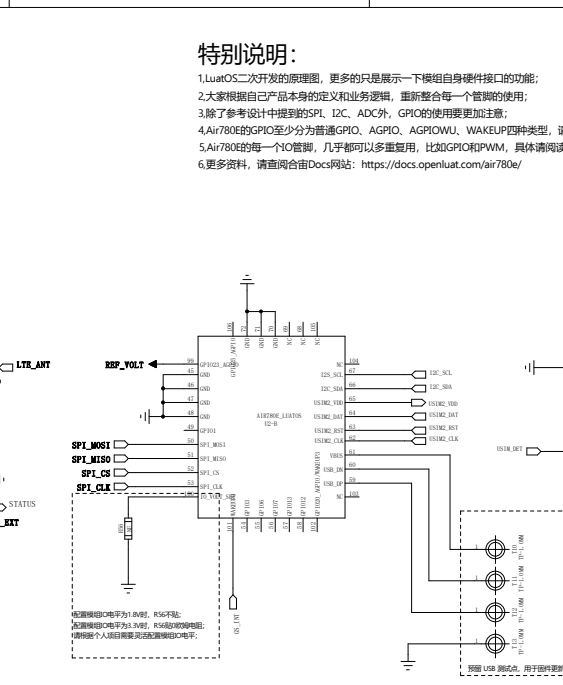
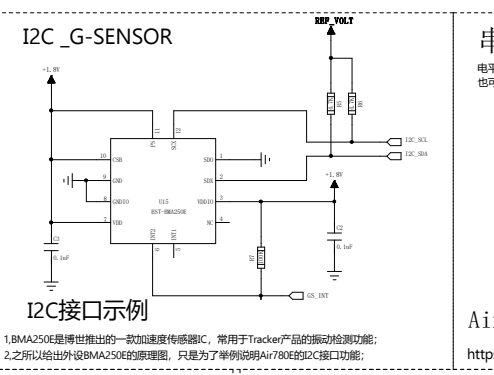


Air780E开机以启动及外围电路设计指导：
<https://docs.openluat.com/air780e/at/hardware/design/poweron/>



REV E3.0M1			
REV	DESCRIPTION	DATE	BY
1.0	1.0	2024-10-18	laolu
2.0	2.0	2024-10-18	laolu
3.0	3.0	2024-10-18	laolu
4.0	4.0	2024-10-18	laolu
5.0	5.0	2024-10-18	laolu
6.0	6.0	2024-10-18	laolu
7.0	7.0	2024-10-18	laolu
8.0	8.0	2024-10-18	laolu
9.0	9.0	2024-10-18	laolu
10.0	10.0	2024-10-18	laolu

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Air780E用于LuoOS使用方式时的参考设计

REV	DESCRIPTION	DATE	BY
1.0	1.0	2024-10-18	laolu
2.0	2.0	2024-10-18	laolu
3.0	3.0	2024-10-18	laolu
4.0	4.0	2024-10-18	laolu
5.0	5.0	2024-10-18	laolu
6.0	6.0	2024-10-18	laolu
7.0	7.0	2024-10-18	laolu
8.0	8.0	2024-10-18	laolu
9.0	9.0	2024-10-18	laolu
10.0	10.0	2024-10-18	laolu

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1.0	1.0	2024-10-18	laolu
2.0	2.0	2024-10-18	laolu
3.0	3.0	2024-10-18	laolu
4.0	4.0	2024-10-18	laolu
5.0	5.0	2024-10-18	laolu
6.0	6.0	2024-10-18	laolu
7.0	7.0	2024-10-18	laolu
8.0	8.0	2024-10-18	laolu
9.0	9.0	2024-10-18	laolu
10.0	10.0	2024-10-18	laolu

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1.0	1.0	2024-10-18	laolu
2.0	2.0	2024-10-18	laolu
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4.0	4.0	2024-10-18	laolu
5.0	5.0	2024-10-18	laolu
6.0	6.0	2024-10-18	laolu
7.0	7.0	2024-10-18	laolu
8.0	8.0	2024-10-18	laolu
9.0	9.0	2024-10-18	laolu
10.0	10.0	2024-10-18	laolu

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1.0	1.0	2024-10-18	laolu
2.0	2.0	2024-10-18	laolu
3.0	3.0	2024-10-18	laolu
4.0	4.0	2024-10-18	laolu
5.0	5.0	2024-10-18	laolu
6.0	6.0	2024-10-18	laolu
7.0	7.0	2024-10-18	laolu
8.0	8.0	2024-10-18	laolu
9.0	9.0	2024-10-18	laolu
10.0	10.0	2024-10-18	laolu

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2.0	2.0	2024-10-18	laolu
3.0	3.0	2024-10-18	laolu
4.0	4.0	2024-10-18	laolu
5.0	5.0	2024-10-18	laolu
6.0	6.0	2024-10-18	laolu
7.0	7.0	2024-10-18	laolu
8.0	8.0	2024-10-18	laolu
9.0	9.0	2024-10-18	laolu
10.0	10.0	2024-10-18	laolu

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2.0	2.0	2024-10-18	laolu
3.0	3.0	2024-10-18	laolu
4.0	4.0	2024-10-18	laolu
5.0	5.0	2024-10-18	laolu
6.0	6.0	2024-10-18	laolu
7.0	7.0	2024-10-18	laolu
8.0	8.0	2024-10-18	laolu
9.0	9.0	2024-10-18	laolu
10.0	10.0	2024-10-18	laolu

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Air780E用于LuoOS使用方式时的参考设计

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2.0	2.0	2024-10-18	laolu
3.0	3.0	2024-10-18	laolu
4.0	4.0	2024-10-18	laolu
5.0	5.0	2024-10-18	laolu
6.0	6.0	2024-10-18	laolu
7.0	7.0	2024-10-18	laolu
8.0	8.0	2024-10-18	laolu
9.0	9.0	2024-10-18	laolu
10.0	10.0	2024-10-18	laolu

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3.0	3.0	2024-10-18	laolu
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6.0	6.0	2024-10-18	laolu
7.0	7.0	2024-10-18	laolu
8.0	8.0	2024-10-18	laolu
9.0	9.0	2024-10-18	laolu
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4.0	4.0	2024-10-18	laolu
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6.0	6.0	2024-10-18	laolu
7.0	7.0	2024-10-18	laolu
8.0	8.0	2024-10-18	laolu
9.0	9.0	2024-10-18	laolu
10.0	10.0	2024-10-18	laolu

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4.0	4.0	2024-10-18	laolu
5.0	5.0	2024-10-18	laolu
6.0	6.0	2024-10-18	laolu
7.0	7.0	2024-10-18	laolu
8.0	8.0	2024-10-18	laolu
9.0	9.0	2024-10-18	laolu
10.0	10.0	2024-10-18	laolu

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5.0	5.0	2024-10-18	laolu
6.0	6.0	2024-10-18	laolu
7.0	7.0	2024-10-18	laolu
8.0	8.0	2024-10-18	laolu
9.0	9.0	2024-10-18	laolu
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6.0	6.0	2024-10-18	laolu
7.0	7.0	2024-10-18	laolu
8.0	8.0	2024-10-18	laolu
9.0	9.0	2024-10-18	laolu
10.0	10.0	2024-10-18	laolu

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6.0	6.0	2024-10-18	laolu
7.0	7.0	2024-10-18	laolu
8.0	8.0	2024-10-18	laolu
9.0	9.0	2024-10-18	laolu
10.0	10.0	2024-10-18	laolu

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4.0	4.0	2024-10-18	laolu
5.0	5.0	2024-10-18	laolu
6.0	6.0	2024-10-18	laolu
7.0	7.0	2024-10-18	laolu
8.0	8.0	2024-10-18	laolu
9.0	9.0	2024-10-18	laolu
10.0	10.0	2024-10-18	laolu

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6.0	6.0	2024-10-18	laolu
7.0	7.0	2024-10-18	laolu
8.0	8.0	2024-10-18	laolu
9.0	9.0	2024-10-18	laolu
10.0	10.0	2024-10-18	laolu

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4.0	4.0	2024-10-18	laolu
5.0	5.0	2024-10-18	laolu
6.0	6.0	2024-10-18	laolu
7.0	7.0	2024-10-18	laolu
8.0	8.0	2024-10-18	laolu
9.0	9.0	2024-10-18	laolu
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3.0	3.0	2024-10-18	laolu
4.0	4.0	2024-10-18	laolu
5.0	5.0	2024-10-18	laolu
6.0	6.0	2024-10-18	laolu
7.0	7.0	2024-10-18	laolu
8.0	8.0	2024-10-18	laolu
9.0	9.0	2024-10-18	laolu
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4.0	4.0	2024-10-18	laolu
5.0	5.0	2024-10-18	laolu
6.0	6.0	2024-10-18	laolu
7.0	7.0	2024-10-18	laolu
8.0	8.0	2024-10-18	laolu
9.0	9.0	2024-10-18	laolu
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3.0	3.0	2024-10-18	laolu
4.0	4.0	2024-10-18	laolu
5.0	5.0	2024-10-18	laolu
6.0	6.0	2024-10-18	laolu
7.0	7.0	2024-10-18	laolu
8.0	8.0	2024-10-18	laolu
9.0	9.0	2024-10-18	laolu
10.0	10.0	2024-10-18	laolu

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1.0	1.0	2024-10-18	laolu
2.0	2.0	2024-10-18	laolu
3.0	3.0	2024-10-18	laolu
4.0	4.0	2024-10-18	laolu
5.0	5.0	2024-10-18	laolu
6.0	6.0	2024-10-18	laolu
7.0	7.0	2024-10-18	laolu
8.0	8.0	2024-10-18	laolu
9.0	9.0	2024-10-18	laolu
10.0	10.0	2024-10-18	laolu

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3.0	3.0	2024-10-18	laolu
4.0	4.0	2024-10-18	laolu
5.0	5.0	2024-10-18	laolu
6.0	6.0	2024-10-18	laolu
7.0	7.0	2024-10-18	laolu
8.0	8.0	2024-10-18	laolu
9.0	9.0	2024-10-18	laolu
10.0	10.0	2024-10-18	laolu

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2.0	2.0	2024-10-18	laolu
3.0	3.0	2024-10-18	laolu
4.0	4.0	2024-10-18	laolu
5.0	5.0	2024-10-18	laolu
6.0	6.0	2024-10-18	laolu
7.0	7.0	2024-1	

模组型号	Air780E PIN		Air780EG PIN		Air780EX PIN		Power default	Alt Func0	Alt Func1	Alt Func2	Alt Func3	Alt Func4	Alt Func5
功能说明	管脚定义	管脚号	管脚定义	管脚号	管脚定义	管脚号	开机时默认状态 输入/输出&拉低/拉高	默认功能0	默认功能1	默认功能2	默认功能3	默认功能4	默认功能5
普通GPIO 低功耗模式下电平无法保持 PSM+模式下电平无法保持	I2C_SCL	67	I2C_SCL	67			I&PU			I2C_SCL		GPIO14	
	I2C_SDA	66	I2C_SDA	66			I&PU			I2C_SDA		GPIO15	
	USB_BOOT	82	USB_BOOT	82	USB_BOOT	6	I&PD	GPIO0					
	GPIO1	49	GPIO1	49			I&PD	GPIO1					
	GPIO2	21	GPIO2	21	GPIO2	21	I&PU	GPIO2					
	GPIO3	54					I&PU	GPIO3					
	GPIO4	80					I&PU	GPIO4					
	GPIO5	81					I&PU	GPIO5					
	GPIO6	55					I&PU	GPIO6					
	GPIO7	56					I&PU	GPIO7					
	SPI_CS	52	SPI_CS	52			I&PU	GPIO8	SPI_CS				
	SPI_MOSI	50	SPI_MOSI	50			I&PU	GPIO9	SPI_MOSI				
	SPI_MISO/AUX_RXD	28/51	SPI_MISO	51	AUX_RXD	28	I&PU	GPIO10	SPI_MISO		UART2_RXD		
	SPI_CLK/AUX_TXD	29/53	SPI_CLK	53	AUX_TXD	29	I&PU	GPIO11	SPI_CLK		UART2_TXD		
	GPIO12	58					I&PU	GPIO12					
	GPIO13	57					I&PU	GPIO13					
	DBG_RXD	38	DBG_RXD	38	DBG_RXD	38	I&PU				UART0_RXD		
	DBG_TXD	39	DBG_TXD	39	DBG_TXD	39	I&PU				UART0_TXD		
	GPIO16	22	GPIO16	22	GPIO16	22	I&PU	GPIO16					
	GPIO17	23	GPIO17	23	GPIO17	23	I&PU	GPIO17					
	MAIN_RXD	17	MAIN_RXD	17	MAIN_RXD	17	I&PU	GPIO18	UART1_RXD				
	MAIN_TXD	18	MAIN_TXD	18	MAIN_TXD	18	I&PU	GPIO19	UART1_TXD				
	GPIO29	30	GPIO29	30	GPIO29	30	I&PD	GPIO29					PWM1
	GPIO30	31	GPIO30	31	GPIO30	31	I&PD	GPIO30					PWM2
GPIO31	32	GPIO31	32	GPIO31	32	I&PD	GPIO31					PWM3	
PWM4	33	PWM4	33	PWM4	33	I&PD					GPIO18	PWM4	
PWM0	26	PWM0	26	PWM0	26	I&PD					GPIO19	PWM0	
AONGPIO 低功耗模式下电平可以保持 PSM+模式下电平可以保持	GPIO20	102	GPIO20	102			I&PD	GPIO20	WAKEUP3				
	GPIO21	107	GPIO21	107			I&PD	GPIO21	WAKEUP4				
	GPIO22	19	GPIO22	19	GPIO22	19	I&PD	GPIO22	WAKEUP5				
	GPIO23	99	GPIO23	99			I&PD	GPIO23					
	GPIO24	20	GPIO24	20	GPIO24	20	I&PD	GPIO24					
	GPIO25	106	GPIO25	106			I&PD	GPIO25					
	GPIO26	25	GPIO26	25	GPIO26	25	I&PD	GPIO26					
	GPIO27	16	GPIO27	16	GPIO27	16	I&PD	GPIO27					
GPIO28	78	GPIO28	78			I&PU	GPIO28						
WAKEUP 低功耗模式下可以作为中断 PSM+模式下电平无法保持	WAKEUP0	101	WAKEUP0	101			I&PU		WAKEUP0				
	VBUS	61	VBUS	61	VBUS	6	I&PD		WAKEUP1				
	USIM_DET	79	USIM_DET	79			I&PU		WAKEUP2				
注意事项:													
1	GPIO共有三种类型：普通GPIO、AONGPIO和WAKEUP；普通GPIO在模组低功耗模式和PSM+模式下无法保持电平，AONGPIO可以；WAKEUP只能作为输入中断，无法设置为输出；AONGPIO也常被写作为AGPIO、AON_GPIO，以下均以AONGPIO的写法进行描述；												
2	模组共有三种功耗模式：常规模式、低功耗模式和PSM+模式；其中，低功耗模式和PSM+模式也常被称之为休眠模式，二者区别是低功耗模式可以保持长连接，PSM+模式不能保持长连接但可以快速唤醒、快速驻网；												
3	AONGPIO在模组低功耗模式和PSM+模式下可以电平保持，可以保持高，也可以保持低；												
4	AONGPIO当做为GPIO中断功能使用时，无法设置为内部上拉或者内部下拉；												
5	AONGPIO输出驱动能力单管脚<=5mA, 但是所有AONGPIO驱动电流总和也不能超过5mA；												
6	普通GPIO输出驱动能力单管脚<=10mA, 但是所有普通驱动电流总和不能超过200mA；												
7	WAKEUP只能作为输入中断，无法设置为输出；												
8	WAKEUP固定电平1.8V，由于内部分压，实测电平电压值在1.1V左右，是正常现象；												
9	WAKEUP管脚内部上下拉非常弱，驱动能力<30uA；												
10	模组在低功耗模式或PSM+模式下只能通过WAKEUP或者MAIN_UART串口唤醒，AONGPIO虽然在休眠下不掉电，但是无法触发中断；												
11	普通GPIO在低功耗模式和PSM+模式下均会处于掉电状态，并且随着系统间歇性唤醒与基站交互而频繁产生高脉冲；												
12	普通GPIO配置为GPIO输出时，默认设置内部上下拉，如果内部上下拉不能满足要求，可以设取消内部默认上下拉，然后外部加上下拉；												
13	普通GPIO配置为输入/中断模式时，内部上下拉无法设置；												
14	GPIO20/GPIO21/GPIO22同时具备AONGPIO和WAKEUP的属性，好处是可以休眠保持和唤醒，坏处是设置为输出时驱动能力<30uA；												
15	GPIO20/GPIO21/GPIO22同时具备AONGPIO和WAKEUP的属性，配置成中断模式时是WAKEUP属性，可以配置上下拉，也可以取消使用外部上下拉；												
16	Air780E模组，PIN28 vs PIN51，PIN29 vs PIN53，在硬件上是同一个信号(一个信号被引到了两处模组管脚)，在软件上AUX_UART和SPI无法同时使用；Air780EG模组，AUX_UART(UART2)已被使用为与GNSS芯片通信用的串口，故无法再配置为其它用途，同时，Air780EG在使用GNSS时也无法再使用SPI功能；												
17	I&PU, Input&Pull_Up;I&PD, Input&Pull_Down;												
18	DBG_TX、DBG_RX默认功能为系统底层日志口，进行模块硬件设计时，需要将这两个管脚通过测试点引出；												
19	Air780E/EX/EG的所有GPIO都支持中断功能； 其中，一部分可以复用为WAKEUP功能的GPIO管脚(GPIO20/GPIO21/GPIO22)支持双边沿或者高低电平中断，低功耗模式、PSM+模式以及常规下都能使用；其余GPIO仅支持单边沿或者单电平中断，常规模式下可用，低功耗模式和PSM+模式不能使用；												
20	Air780E/EX/EG所有的GPIO在配置为输入功能时，只可以选择使用/不使用默认上下拉，不能自由配置为上拉或下拉，如果要使用和默认上下拉相反的电平，必须关闭内部上下拉后在外部加上下拉；												