QinNav 钦天导航

PRODUCT SPECIFICATION

产品规范

适用于 For

QM623 GNSS 模块
QM623 GNSS Module

REVISION HISTORY / 修订历史

Revision/版本	Modification/更改	Date/日期
1.0	New Release / 新发	2023/2/10

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1. INTRODUCTION / 简介

QM623 module is a full-system, multi-frequency, small-size, high-precision positioning and orientation OEM module independently developed by Sinan Navigation. It meets the requirements of multi-system and multi-frequency navigation satellite system modules. Galileo and SBAS and QZSS. Suitable for applications such as drones and handheld devices where module size, weight and power consumption are critical.

QM623 模块是司南导航自主研发的全系统、多频点、小尺寸高精度定位、定向 OEM 模块，满足多系统多频点导航卫星系统模块需求，支持 GPS 、 BDS-2 、 BDS-3 、 GLONASS 、 Galileo 以及 SBAS 和 QZSS 。适用于如无人机和手持设备等对模块尺寸、重量和功耗要求严格的领域。

1.1. Product Characteristics / 产品特性

Table 1. Product Characteristics / 产品特性

Characteristics	QM623	
Signals **信号**	**Positioning** **定位**	GPS: L1C/A, L2C, L2P*
		BDS-2: B1I, B2I, B3I BDS-3: B1I, B3I, B2b
		GLONASS: G1, G2
		Galileo: E1, E5b
		QZSS: L1C/A, L2C
		SBAS: L1C/A
		L-Band*
	Directional **定向**	GPS: L1C/A, L2C, L2P*
		BDS-2: B1I, B3I BDS-3: B1I, B3I, B2b

		GLONASS: G1, G2
		Galileo: E1, E5b
		QZSS: L1C/A, L2C
	Items with * will be adjusted with the version. 带*项会随同版本进行调整。	
Time to First Fix **首次定位时间**	**Cold Start** **冷启动**	< 20s（Adding Acceleration Capture Module,增加捕获加速模块）
	Hot Start (with RTC) **热启动（使用RTC）**	< 10s（Typical,典型）
Signal Capture **信号捕获**	**Reacquisition** **失锁重捕**	< 1s
	Signal Capture Sensitivity **信号捕获灵敏度**	-138dBm
Measurement Precision **测量准确度**	**Pseudo-range Precision** **伪距精度**	≤ 10cm
	Carrier Phase Precision **载波相位精度**	≤ 1mm
Accuracy **精度**	**Time Accuracy** **授时精度**	20ns
	SPP Accuracy **标准单点定位精度**	H ≤ 1.5m, V ≤ 3m (1σ, PDOP≤4)
	Static Differential Accuracy (Supported by Compass Solution)	H: $\pm(2.5+1\times10^{-6}\times D)$ mm V: $\pm(5.0+1\times10^{-6}\times D)$ mm D为基线长度(单位：mm)

	静态差分精度（Compass Solution软件支持)	D - Baseline length (Unit: mm)
	Speed Accuracy **测速精度**	≤ 0.02 m/s (PDOP ≤4)
Anti-interference **抗干扰**	It can suppress the potential narrowband and single tone radio interference signals in the GNSS signal frequency band, and the interference to signal ratio can reach 50dB. 具备抑制GNSS信号频带内潜在的窄带和单音无线电干扰信号，干信比可达 50dB。	
RTK	**RTK Initialization Time** **RTK初始化时间**	< 5s（baseline < 10km，基线长小于 10km）
	Initialization Reliability **初始化置信度**	> 99.9 %
	RTK Accuracy **RTK精度**	H: ± (8 + 10^{-6} × D) mm V: ± (15 + 10^{-6} × D) mm D为基线长度(单位：mm) D - Baseline length (Unit: mm)
Attitude Accuracy **测姿精度**	**Azimuth Accuracy** **方位角精度**	(0.15/R) °, R is baseline length in meter. R为基线长度，单位为米
	Roll or Pitch Accuracy **横滚或俯仰角**	(0.25/R) °, R is baseline length in meter. R为基线长度，单位为米
Data Rates **数据速率**	**Measurements & Position** **测量&定位**	Max 20Hz（Optional，选配项）
	RTK: Positioning & Heading **RTK：定位&定向**	Max 20Hz（Optional，选配项）
Electrical	**Voltage**	+ 3.3 V ± 5 % DC

电气特性	**供电电压**	
	Power Consumption **功耗**	1.6 W (Anti-interference off，未开启抗干扰) Set anti-interference on consumes more about 0.2W 抗干扰功能开启，功耗约增加 0.2W
Environmental **环境要求**	**Operating Temperature** **工作温度**	-40℃ ~ +85℃
	Storage Temperature **储存温度**	-55℃ ~ +95℃
Data Formats **输出数据格式**	**NMEA-0183**	GPGGA, GPGSV, GPGLL, GPGSA, GPGST, GPHDT, GPRMC, GPVTG, GPZDA etc.
	QinNav Binary（CNB） **钦天二进制格式**	QinNav Self-Defined Binary 钦天自定义二进制
	CMR(GPS)	CMROBS, CMRREF
	RTCM2.X	RTCM1, RTCM3, RTCM9, RTCM1819, RTCM31, RTCM41, RTCM42
	RTCM3.X	1004~1008,1012,1019,1020,1033,1042,1045/1046, 1230,4078 MSM3~MSM7:1073~1077,1083~1087,1123~1127,1093~1097
Antenna Interface **天线接口**	**Impedance Matching** **阻抗匹配**	Wiring 50 Ohm impedance matching 布线 50 欧姆阻抗匹配
	LNA Power **天线供电电压**	External 外部供电: +3.3V ~ +5V ± 5%VDC @ 0-100mA
	LNA Gain **天线增益**	20 ~ 35dB

		Antenna gain is lower than 20dB or higher than 35dB, which may cause signal crosstalk and other problems. 增益低于 20dB或者高于 35dB,可能会造成信号串扰等问题
Hardware Interface **硬件接口**		表贴LGA（60PIN）
Physical **物理参数**	**Size 尺寸**	30mm×40mm×3.2mm
	Weight 重量	10.0 grams (克)
	Flatness 平整度	≤ 0.1mm

2. QM623 Product Size / QM623 尺寸

In this section, product photo, three-side views and the dimension of QM623 is provided for customers' further hardware design and installation.

本节提供了QM623的实物图，三视图和对应的物理尺寸，便于用户进一步系统硬件设计和安装。

Figure 1. QM623 Product Photo / QM623 实物图

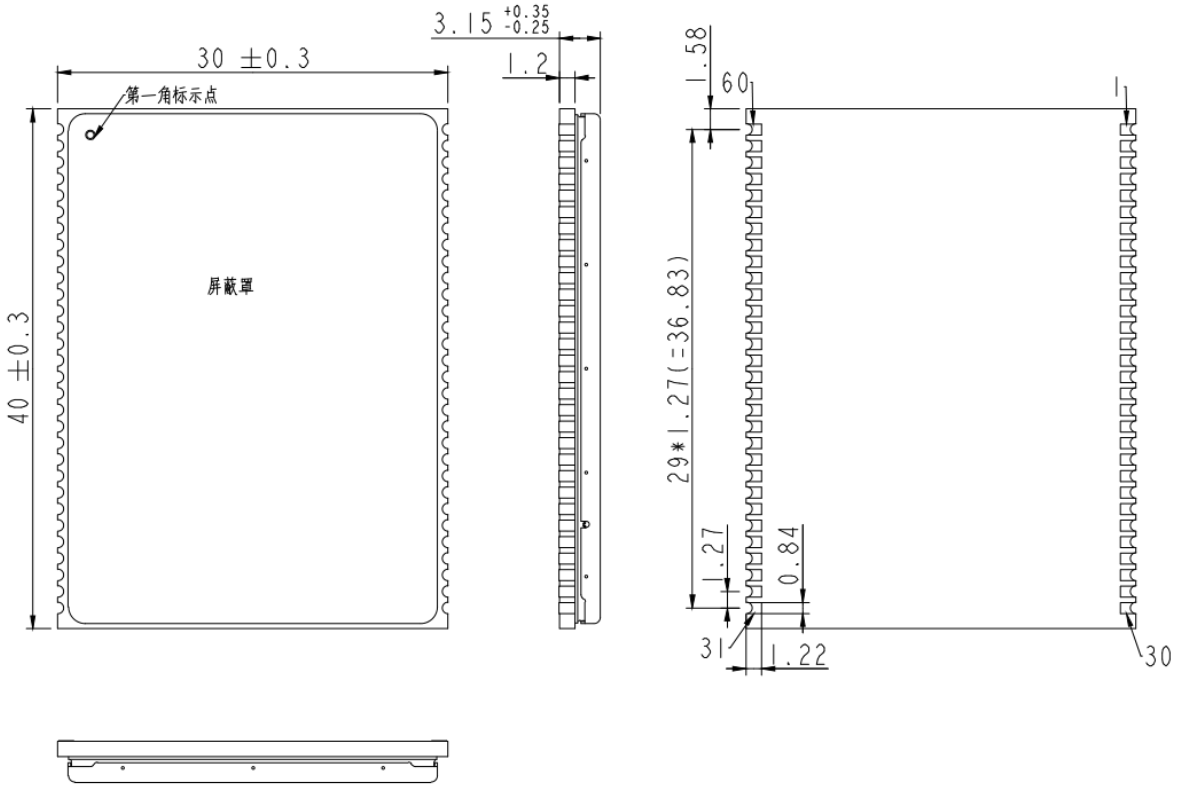

Figure 2. QM623 Dimension View / QM623 三视图

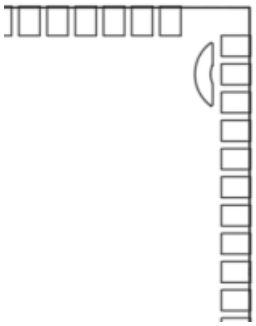

Figure 3. QM623 Bottom Section View / QM623 底部部分视图

Note: Since there is a half moon shaped window at the top right and bottom of QM623 module for tin loading, it is recommended that the user try to move the bonding pad inward when packaging, otherwise there will be a short circuit.

注意：因为QM623模块右上底部有半月形开窗上锡位置，建议用户封装时，焊盘尽量往里去，否则会短路。

3. PIN Arrangement and Definition / 针脚标识和定义

QM623 is surface-mount OEM Module which integrates 60 pins (pitch 1.27mm).

QM623包括60pin，表贴式模块（pitch 1.27mm）。

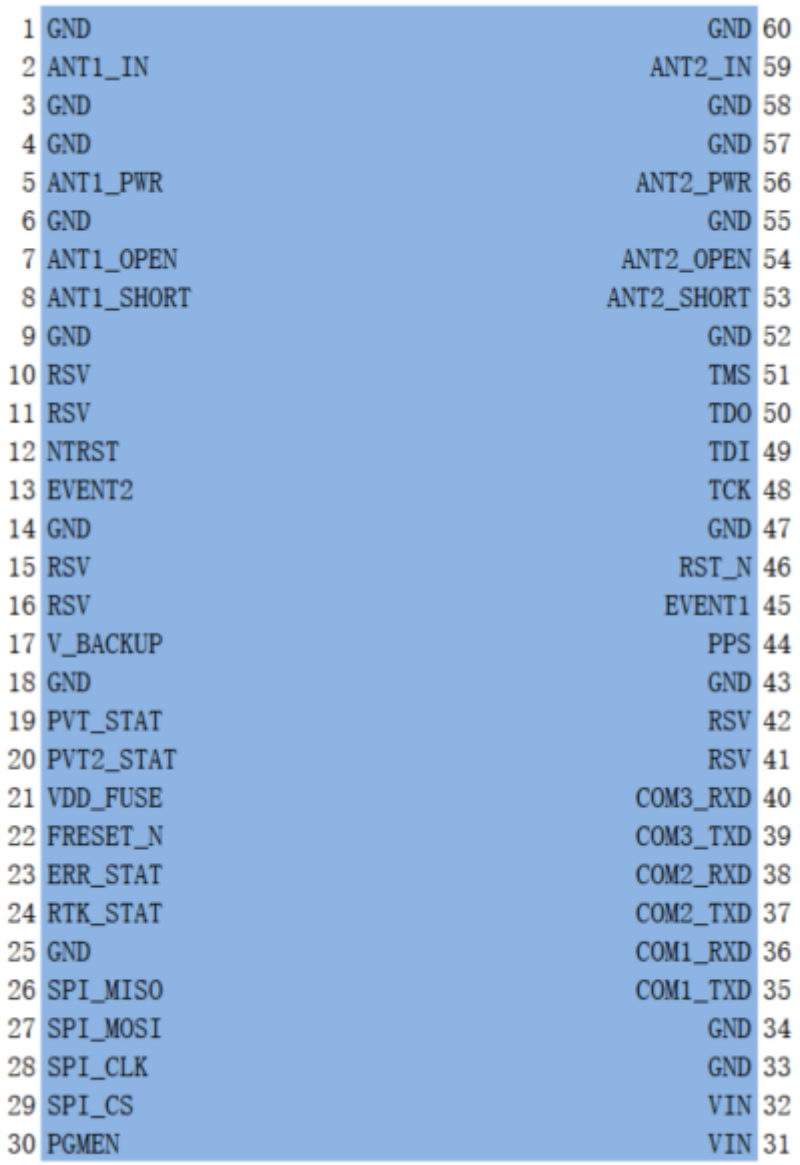

Figure 4. QM623 Includes 60-Pin Pad / QM623 包括60连接焊盘

Table 2. Pin Definition of QM623 60-Pin Pad / QM623 60针脚焊盘的针脚定义

PIN	SIGNAL	TYPE	DESCRIPTION	
1	GND	GND	Ground Reference	参考地
2	ANT1_IN	I	GNSS Positioning antenna	GNSS定位天线
3~4	GND	GND	Ground Reference	参考地

PIN	SIGNAL	TYPE	DESCRIPTION	
5	ANT1_PWR	PWR	Power supply for external GNSS Positioning antenna LNA	外部GNSS定位天线供电
6	GND	PWR	Ground Reference	参考地
7	ANT1_OPEN	O	Open Indication of Positioning Antenna	定位天线断路指示（低有效）
8	ANT1_SHORT	O	Short Indication of Positioning Antenna	定位天线短路指示（低有效）
9	GND	GND	Ground Reference	参考地
10~11	RSV	/	Reserve (Float)	保留管脚（悬空）
12	NTRST	I	JTAG NTRST (Float)	JTAG NTRST（悬空）
13	EVENT2	I	Event Mark	外部事件输入
14	GND	GND	Ground Reference	参考地
15~16	RSV	/	Reserve (Float)	保留管脚（悬空）
17	V_BACKUP	PWR	Power Supply for Internal RTC	外接RTC电池
18	GND	GND	Ground Reference	参考地
19	PVT_STAT	O	PVT Status	主天线搜星数指示灯，高电平有效，模块能进行定位时输出高电平。不定位输出低电平，主天线指示灯。
20	PVT2_STAT	O	PVT2 Status	从天线搜星数指示灯，高电平有效，模块能进行定位时输出高电平。不定位输出低电平，从天线指示灯。
21	VDD_FUSE	PWR	Power Supply for Internal FUSE (Float)	FUSE烧录电源输入（悬空）
22	FRESET_N	I	Reset to Factory Mode, Active Low	复位为出厂模式，低电平有效
23	ERR_STAT	O	Abnormal Light, Active High	异常指示灯，高电平有效，模块系统自检不通过时，输出高电平；自检通过输出低电平。
24	RTK_STAT	O	RTK Data LED Indicator	RTK数据指示灯，在接收到差分信号时会输出高电平。其他定位状态或者不定位输出低电平。
25	GND	GND	Ground Reference	参考地
26	SPI_MISO	I	SPI_MISO	SPI主输入从输出信号
27	SPI_MOSI	O	SPI_MOSI	SPI主输出从输入信号
28	SPI_CLK	O	SPI_CLK	SPI总线时钟信号
29	SPI_CS	O	SPI_CS	SPI总线片选信号
30	PGMEN	I	Program Enable (Float)	烧录使能（悬空）

PIN	SIGNAL	TYPE	DESCRIPTION	
31~32	VIN	PWR	DC Power Supply for Module (+3.3V)	模块供电电源（+3.3V）
33~34	GND	GND	Ground Reference	参考地
35	COM1_TXD	O	Transmitted Data for COM 1 Output	串口1输出信号
36	COM1_RXD	I	Received Data for COM 1 Input	串口1输入信号
37	COM2_TXD	O	Transmitted Data for COM 2 Output	串口2输出信号
38	COM2_RXD	I	Received Data for COM 2 Input	串口2输入信号
39	COM3_TXD	O	Transmitted Data for COM 3 Output	串口3输出信号
40	COM3_RXD	I	Received Data for COM 3 Input	串口3输入信号
41~42	RSV	/	Reserve (Float)	保留管脚（悬空）
43	GND	GND	Ground Reference	参考地
44	PPS	O	Pulse Output Synchronized to OEM Time	同步卫星时间脉冲
45	EVENT1	I	Event mark	外部事件输入
46	RST_N	I	Quick Reset without Clearing User Configuration (Low Active)	快速复位，不清除用户配置（低电平有效）
47	GND	GND	Ground Reference	参考地
48	TCK	I	JTAG TCK (Float)	JTAG TCK（悬空）
49	TDI	I	JTAG TDI (Float)	JTAG TDI（悬空）
50	TDO	O	JTAG TDO (Float)	JTAG TDO（悬空）
51	TMS	I	JTAG TMS (Float)	JTAG TMS（悬空）
52	GND	GND	Ground Reference	参考地
53	ANT2_SHORT	O	Short Indication of Orientation Antenna (Low Active)	定向天线短路指示（低电平有效）
54	ANT2_OPEN	O	Open Indication of Orientation Antenna (Low Active)	定向天线断路指示（低电平有效）
55	GND	PWR	Ground Reference	参考地
56	ANT2_PWR	PWR	Power Supply for External GNSS Orientation Antenna LNA	外部GNSS定向天线供电
57~58	GND	GND	Ground Reference	参考地
59	ANT2_IN	I	GNSS Orientation Antenna	GNSS定向天线
60	GND	GND	Ground Reference	参考地

3.1. Remarks / 说明

1. Electrical Characteristics / 电气特性

COM1/2/3/4(TX&RX), SPI, ANT1/2(OPEN&SHORT), JTAG, GPIO, FRESET_N, ERR_STAT, RTK_STAT, PGMEN, RST_N, PPS EVENT and EVENT2 are LVCMOS 3.3V level, All these signals are LVCMOS/LVTTL 3.3V compatible.

COM1/2/3/4（TX&RX），SPI，ANT1/2（OPEN&SHORT），JTAG，GPIO，FRESET_N，ERR_STAT，RTK_STAT，PGMEN，RST_N，PPS，EVENT和EVENT2为LVCMOS 3.3V 电平，所有这些信号均兼容LVCMOS / LVTTL 3.3V。

Table 3. LVCMOS 3.3V Electrical Standard / LVCMOS 3.3V电气标准

Symbols 符号	Description 描述	Min 最小	Max 最大
VIH	Input high voltage 输入高电压	2.0V	3.6V
V_{IL}	Input low voltage 输入低电压	-0.3V	0.8V
V_{OH}	High-level output voltage 高电平输出电压	2.9V	--
V_{OL}	Low-level output voltage 低电平输出电压	--	0.4V
I_{OH}	Sourcing current 拉电流	8mA	
I_{OL}	Sinking current 灌电流	8mA	

Table 4. LVTTL 3.3V Electrical Standard / LVTTL 3.3V电气标准

Symbols 符号	Description 描述	Min 最小	Max 最大
VIH	Input high voltage 输入高电压	2.0V	--
V_{IL}	Input low voltage 输入低电压	-0.3V	0.8V
V_{OH}	High-level output voltage 高电平输出电压	2.4V	--
V_{OL}	Low-level output voltage 低电平输出电压	--	0.4V
I_{OH}	Sourcing current 拉电流	8mA	
I_{OL}	Sinking current	8mA	

Symbols 符号	Description 描述	Min 最小	Max 最大
	灌电流		

2. Can withstand Voltage Range / 能承受的电压范围

The maximum voltage range is -0.3V ~ 3.6V. The signals are as follows: COM1/2/3/4 (TX&RX), SPI, ANT1/2(OPEN&SHORT), JTAG, PVT_STAT, PVT2_STAT, FRESET_N, ERR_STAT, RTK_STAT, PGMEN, RST_N, PPS, EVENT and EVENT2.

所能承受电压的最大值范围是-0.3V~3.6V的信号如下：COM1/2/3/4（TX&RX），SPI，ANT1/2（OPEN&SHORT），JTAG，PVT_STAT，PVT2_STAT，FRESET_N，ERR_STAT，RTK_STAT，PGMEN，RST_N，PPS，EVENT和EVENT2。

3. Supply Voltage / 供电电压

VIN main power supply, voltage range: 3.3V (DC). Voltage ripple and spikes require less than 50mV. QM623: ANT1_PWR / ANT2_PWR, voltage range: 3.3V ~ 5.5V (DC). Voltage ripple and spikes require less than 50mV. V_BACKUP, the voltage is 1.8V~3.6V, and the voltage ripple and spikes are required to be less than 30mV.

VIN主供电电源，电压范围：3.3V（直流）。电压纹波和尖峰脉冲要求小于50mV。QM623：ANT1_PWR/ANT2_PWR，电压范围：3.3V~5.5V（直流）。电压纹波和尖峰脉冲要求小于50mV。V_BACKUP，电压1.8V~3.6V，电压纹波和尖峰脉冲要求小于30mV。

4. ERR_STAT / RTK_STAT / PVT_STAT

ERR_STAT abnormal indicator, high level is valid, when the module system self-check fails, it outputs a high level; the module self-check passes and outputs a low level. RTK_STAT positioning indicator, high level is valid, output high level when RTK is fixed, output low level in other positioning states or no positioning, need to add LED indicator. PVT_STAT is a positioning indicator for QM623 OEM Module. The high level is valid and the module can output high level when positioning. Do not locate the output low level.

ERR_STAT异常指示灯，高电平有效，模块系统自检不通过时，输出高电平；模块自检通过输出低电平。RTK_STAT定位指示灯，高电平有效，RTK固定解时输出高电平，其他定位状态或者不定位输出低电平，需要外加LED指示灯。PVT_STAT是一个针对QM623 OEM模块的定位指

示灯，高电平有效，模块能进行定位时输出高电平。不定位输出低电平。

5. Add Surge Protection / 增加浪涌保护

The QM623 module has the function of feeding the antenna from the inside, but in order to effectively prevent lightning strikes, anti-surge, and prevent the damage of the feeding current limiting chip inside the module, it is recommended that users supply power to the antenna from the outside of the module.

If you need to feed the antenna from the outside, it is recommended to use a high-voltage, high-power feeder chip; or add high-power protection devices such as gas discharge tubes, varistors, and TVS tubes to the feeder circuit.

QM623模块拥有从内部为天线馈电的功能，但为了有效防雷击、防浪涌，防止模块内部的馈电限流芯片损坏,建议用户从模块外部给天线供电。

如需从外部为天线馈电，建议选用高耐压、大功率的馈电芯片；或在馈电电路上增设气体放电管、压敏电阻、TVS管等大功率的防护器件。

6. Antenna Short Circuit Open Circuit Description / 天线短路开路说明

When using the internal feed of the board, the following situations will occur:

1) When the antenna is normal, Pin 7、8、53 and 54 output high level;
2) When the antenna is short-circuited, Pin 8 outputs a low level, and Pin 7 outputs a high level or Pin 53 outputs a low level, and Pin 54 outputs a high level;
3) When the antenna is disconnected (the antenna is not connected), Pin 8 outputs a high level, and Pin 7 outputs a low level or Pin 53 outputs a high level, and Pin 54 outputs a low level.

当使用板卡内部馈电时，会出现如下情况：

1) 天线正常时，Pin脚7、8、53和54输出高电平；
2) 天线短路时，Pin脚8输出低电平，Pin脚7出高电平或者Pin脚53输出低电平，Pin脚54出高电平；
3) 天线断路（没接天线）时，Pin脚8输出高电平，Pin脚7出低电平或者Pin脚53输出高电平，Pin脚54出低电平。

7. Hardware Integration Considerations / 硬件集成注意事项

1) VCC power-on has good monotonicity, and the initial level is lower than 0.4V, and the undershoot and ringing are guaranteed within the range of 5% VCC;
2) Use the VCC pin to provide a reliable power supply and all GND pins of the module are grounded;
3) Connect the ANT_IN signal to the antenna, pay attention to the 50 ohm impedance matching of the line;
4) The ANT_PWR pin is connected to +3.3~5.5V voltage, and then provides +3.3~5.5V feed to the antenna through the ANT_IN pin;
5) The module reset pin FRESET_N is for restoring the factory settings of the module, and RST_N is for quick reset. Please connect it correctly to ensure that the module can be reset reliably;
6) When ANT_NLOD, ANT_FFLG, and the antenna detection indication signal are connected, the I/O of the client MCU side is required to be input, and there is no pull-up or pull-down;
7) Special attention should be paid to:
   Power supply: The guarantee of stable and low ripple power supply, the peak-to-peak value of the ripple voltage is preferably not higher than 50mVpp. It is recommended to use a power chip with a current output capacity greater than 2A to supply power to the board.
   In addition to using LDO to ensure the power supply is pure, it is also necessary to consider:
   ①. Widening the power traces or using split copper surfaces to transmit current;
   ②. Place the LDO as close to the module as possible in the layout;
   ③. Avoid the power traces passing through high power with high inductance devices such as magnetic coils.
8) Antenna interface: The antenna line is as short and smooth as possible, avoiding acute angles; pay attention to 50ohm impedance matching;
9) Avoid wiring directly under the QM623;
10) The module is as far away from the high temperature airflow as possible.

1) VCC上电具有良好的单调性，且起始电平低于0.4V，下冲与振铃保障在5%VCC范围内；
2) 用VCC引脚提供可靠的电源且模块所有GND引脚接地；
3) 连接ANT_IN信号至天线,注意线路50欧姆阻抗匹配；
4) ANT_PWR脚接入+3.3~5.5V电压，再经由ANT_IN pin脚对天线提供+3.3~5.5V的馈电；
5) 模块复位引脚FRESET_N为恢复模块出厂设置，RST_N为快速复位，请正确连接以保证模块可以可靠复位；
6) ANT_NLOD，ANT_FFLG，天线检测指示信号相连接时，需要客户MCU端I/O为输入，

且无任何上下拉；

7) 在设计中应特别注意：
供电：稳定及低纹波电源的保证，纹波电压峰峰值最好不高于50mVpp。建议采用电流输出能力大于2A的电源芯片给板卡供电。
除了可采用LDO保证供电纯净外，还需要考虑：
①. 加宽电源走线或采用分割铺铜面来传输电流；
②. 布局上尽量将LDO靠近模块放置；
③. 电源走线避免经过大功率与高感抗器件如磁性线圈。
8) 天线接口：天线线路尽量短且顺畅，避免走锐角；注意50ohm阻抗匹配；
9) 避免在QM623正下方走线；
10) 模块尽量远离高温气流。

8. Static Electricity Protection / 静电保护

Some components on the QM623 module are easily damaged by static electricity, which in turn affects the IC circuit and other components. Therefore, you should pay attention to electrostatic protection measures when using it.

1) When handling the module, try to wear gloves or finger cots and an anti-static wrist strap that meets the electrostatic protection standards;
2) During the process of taking the module, only the edge of the board should be taken, and the solder joints, circuit parts or components should not be directly touched to avoid sweat fingerprints from contaminating the solder joints;
3) The module should be protected by a soft protective pad between the module and the module interval during transportation;
4) When the module is idle, it should be placed on a soft protective pad (such as anti-static sponge pad, etc.), and do not stack at will;
5) The modules should be placed neatly and orderly, with a certain interval between modules to avoid collision with each other;
6) The module should be handled with care during use to prevent the module from being damaged by rough operation;
7) When powering on, pay attention to the positive and negative poles of the power supply and the voltage to avoid reverse connection and excessive voltage from burning the module;
8) When soldering the module to the motherboard, please ensure that the GND is soldered first, and then the ANT_IN pin;
9) When handling the ANT_IN pin, please do not remove any charged capacitors or materials (such as surface mount antennas, coaxial cables, electrical iron, etc.), so

as not to damage the ANT_IN pin due to the charge generated or stored by the capacitors or materials;

10) Please make sure to solder the ANT_IN pin with an electrical protection iron.

QM623模块上的部分元器件易受静电影响而损坏，进而影响IC电路及其他元件。因此在使用时应注意做好静电保护措施。

1) 拿取模块时应尽量戴好手套或者指套以及符合静电防护标准的防静电腕带；
2) 模块拿取过程中应只拿取板卡的边缘部位，不能直接接触焊点，线路部分或者元器件，避免汗液指印污染焊点；
3) 模块在运输过程中模块与模块间隔之间应该采用软性防护垫进行保护；
4) 模块闲置时应放置在软性防护垫上（如防静电海绵垫等），不要随意堆叠；
5) 模块摆放应摆放整齐有序，模块之间保持一定间隔，避免相互碰撞；
6) 模块在使用过程中应该轻拿轻放，防止粗暴作业损坏模块；
7) 上电时，注意电源正负极以及电压，避免反接和电压过高烧毁模块；
8) 将模块焊接到主板时，请确保GND先焊接，然后再焊接ANT_IN引脚；
9) 处理ANT_IN引脚时，请不要解除任何带电电容或材料（例如表贴天线、同轴电缆、电络铁等），以免所述电容或材料所产生或存储的电荷损坏ANT_IN引脚；
10) 请确保使用带电保护的电络铁焊接ANT_IN引脚。

4. Assembling & Repairing Note / 装配及维修说明

4.1. Module Assembling Note / 模块装配说明

QM623 is surface mounted, SMT welding is recommended for assembly.

QM623为表贴式模块，推荐使用SMT的焊接方式进行装配

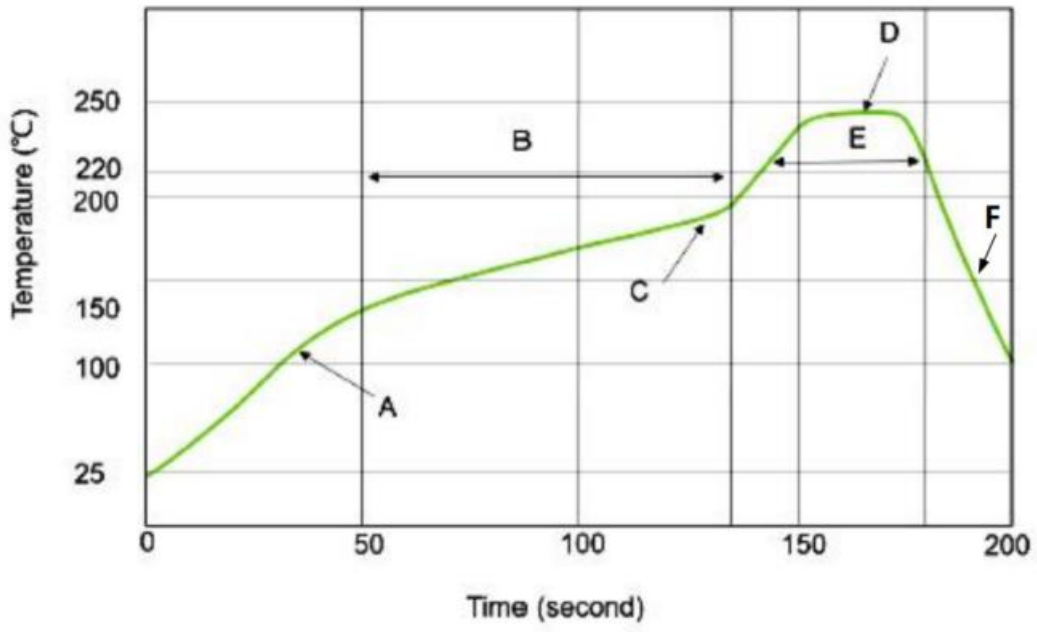

Figure 5. Furnace Temperature Curve / 炉温曲线

The process temperature limits are as follows:

A: Heating Zone: Rising Slope: 1 ~ 3℃ / sec

B: Constant Temperature Zone: Range: 150 ~ 190 ℃ Time: 80 ~ 110 S

C: Constant Temperature→Reflow Zone: Rising Slope: 1 ~ 3℃ / sec

D: Peak Temperature: 235 ~ 245℃

E: Reflow Zone: Range: Over 220℃ Time: 50 ~ 80 S

F: Descent Slope: -5℃ ~ -1℃ / sec

制程温度界限如下：

A：升温区： 斜率：1 ~ 3℃ / sec

B：恒温区： 150 ~ 190℃ 时间：80 ~ 110S

C：恒温→回流区： 斜率：1 ~ 3℃ / sec

D：峰值温度： 235 ~ 245℃

E：回流区： 大于220℃ 时间：50 ~ 80S

F：下降斜率： -5 ~ -1℃ / sec

In order to prevent the module from being damaged by repeated heating, it is recommended to place the module after finishing the first side of PCB board.

为避免模块因反复受热而损坏，建议在完成PCB板第一面的回流焊之后再贴模块。

4.2. Repairing Note / 维修说明

When disassembling the module, it is suggested using a BGA welding bench. Please use correct air tuyere and choose certain temperature curve. Keep peak temperature under 245℃, rising slope under 3℃/s.

拆卸模块时，请使用BGA返修台，选择适合尺寸的风嘴并使用合适的温度曲线，最高温度不超过245℃，升温斜率不超过3℃/s。

5. Application Connection Example / 应用连接示例

In this section, an application connection example of QM623 OEM Module is presented via specific schematic diagrams. Per the instruction of these diagrams, you could easily build the communication circuits between QM623 OEM Module and other terminals such as PC, GPRS or Bluetooth module, and some other devices with an UART.

本部分以具体电路的形式提供一个QM623模块应用连接示例。参照下面的图示，您可以很方便建立QM623模块和其他终端（如PC，GPRS模块，蓝牙模块或其他带有UART的设备）之间的通讯电路。

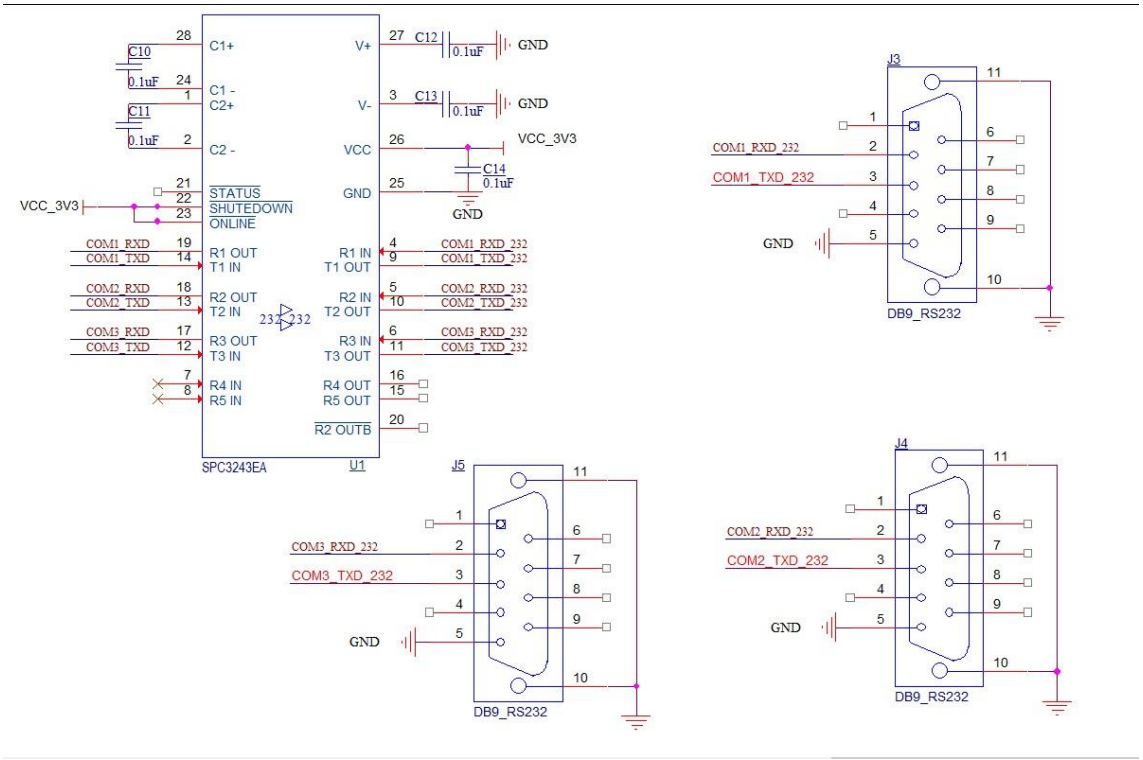

Figure 6. Connections between RS232 COM1, 2, 3 of QM623 and Some Other Devices with an UART / QM623 RS232 COM1、2、3与其他使用UART接口的设备之间的连接示意

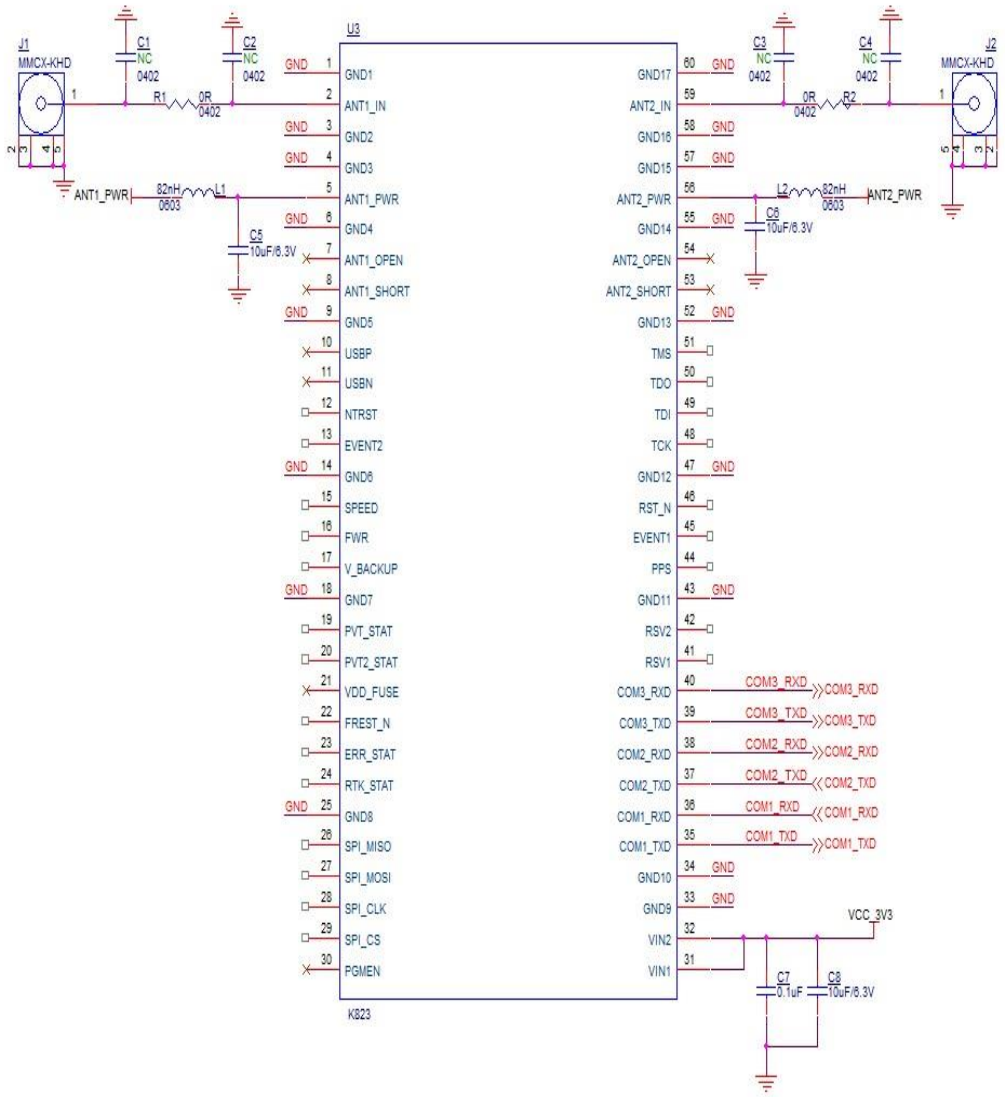

Figure 7. Minimum Hardware Design of QM623 / QM623 最小硬件设计

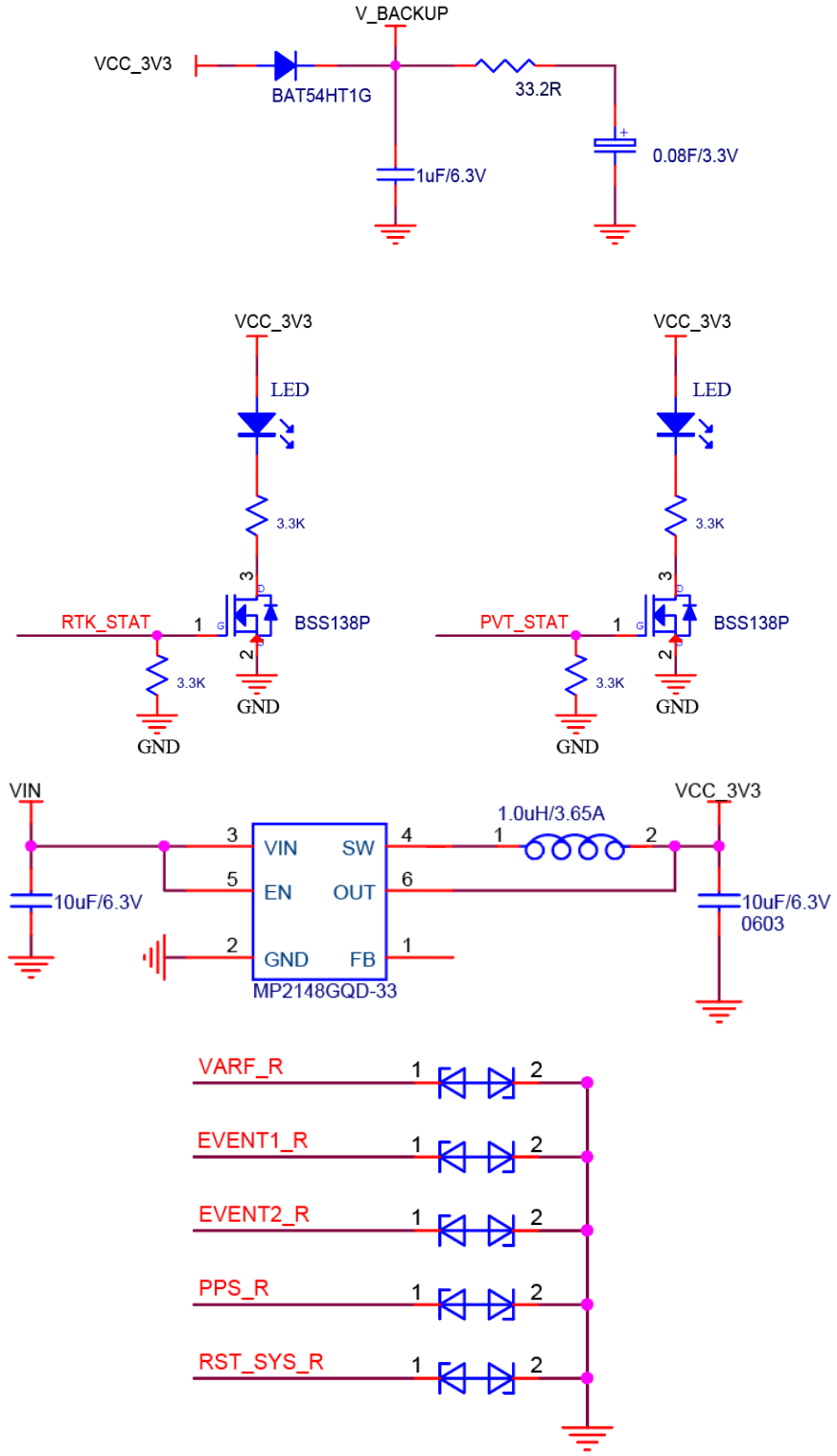

Figure 8. Recommend Design of QM623 / QM623 推荐硬件设计