



司南导航

QinNav
软天导航

PRODUCT SPECIFICATION

产品规范

适用于

For

K801 GNSS 模块

K801 GNSS Module

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REVISION HISTORY / 修订历史

Revision/版本	Modification/更改	Date/日期
1.0	New Release. / 新发	2023-09-08

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1. Introduction / 简介

The K801 module is a multi-system, multi-frequency, mini-size, high-precision positioning OEM module independently developed by QinNav Technology Ltd. It supports signal positioning, including GPS, BDS-2, BDS-3, GLONASS, Galileo, SBAS and QZSS, it is mainly used for Mower, UAV and handheld devices with size, weight, and power requirements.

K801 模块是钦天导航自主研发的多系统、多频点、小尺寸高精度定位 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。适用于如割草机、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		K801
Signals 信号	Positioning 定位	GPS: L1C/A, L5
		BDS: B1I, B2a
		GLONASS: G1
		Galileo: E1, E5a
		QZSS: L1C/A, L5
		SBAS: L1C/A
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	<24s
Signal Capture 信号捕获	Signals Tracking Sensitivity 信号跟踪灵敏度	-165dBm
	Signal Capture Sensitivity 信号捕获灵敏度	-148dBm
Accuracy	Time Accuracy (RMS)	5ns

精度	授时精度	
	SPP Accuracy 标准单点定位精度	$H \leq 1.5m, V \leq 3m$ ($1\sigma, PDOP \leq 4$)
	Speed Accuracy 测速精度	$\leq 0.02m/s$ ($1\sigma, PDOP \leq 4$)
RTK	RTK Initialization Time RTK初始化时间	< 15s (baseline < 10km, 基线长小于10km)
	Initialization Reliability 初始化置信度	>99.9%
	RTK Accuracy RTK精度	$H: \pm(10+10^{-6} \times D)mm$ $V: \pm(15+10^{-6} \times D)mm$ D为基线长度(单位: mm) D-Baseline length (Unit: mm)
IMU Gyroscope* IMU陀螺仪*	Range 量程	$\pm 250^\circ/s$
	Zero bias stability 零偏稳定性	3.5°/h
IMU Accelerometer* IMU加速度仪*	Range 量程	$\pm 8g$
	Zero bias stability 零偏稳定性	25 μg (x, y) 100 μg (z)
Data Rates 数据速率	Measurements & Position 测量&定位	5Hz (选配) (Optional)
	RTK: Positioning RTK: 定位	5Hz (选配) (Optional)

	IMU*	50 Hz (选配) (Optional)
Data Formats 输出数据格式	NMEA-0183	GPGGA, GPGSV, GPGLL, GPGSA, GPGST, GPRMC, GPVTG, GPZDA, GPNTR etc.
	RTCM3.X	1005, 1019, 1020, 1042, 1044, 1046 MSM4: 1074, 1084, 1094, 1114, 1124 MSM7: 1077, 1087, 1097, 1117, 1127
Electrical 电气特性	Voltage 供电电压	+ 3.3V~3.45V DC
	Power Consumption 功耗	0.15 W (默认开启抗干扰, Anti-Interference on)
Environmental 环境要求	Operating Temperature 工作温度	-40°C~+85°C
	Storage Temperature 储存温度	-40°C ~ +85°C
Antenna Interface 天线接口	Impedance Matching 阻抗匹配	50Ω
	Antenna Power 天线供电电压	External 外部供电: +3.3V~+5V @ (0-100) mA
	Antenna Gain 天线增益	15dB~35dB
Hardware Interface 硬件接口		LGA (24PIN) UARTx2, PPSx1, I2Cx2, USBx1
Physical	Size 尺寸	12mm×16mm×2.2mm

物理参数	Weight 重量	1.0g
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2. Size / 尺寸

In this section, product photo, three-side views and the dimension of K801 is provided for customers' further hardware design and installation.

本节提供了K801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. K801 Product Photo / K801 实物图

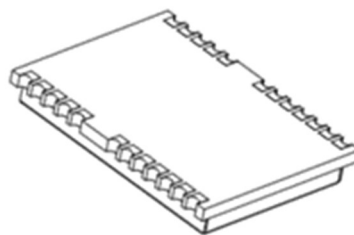
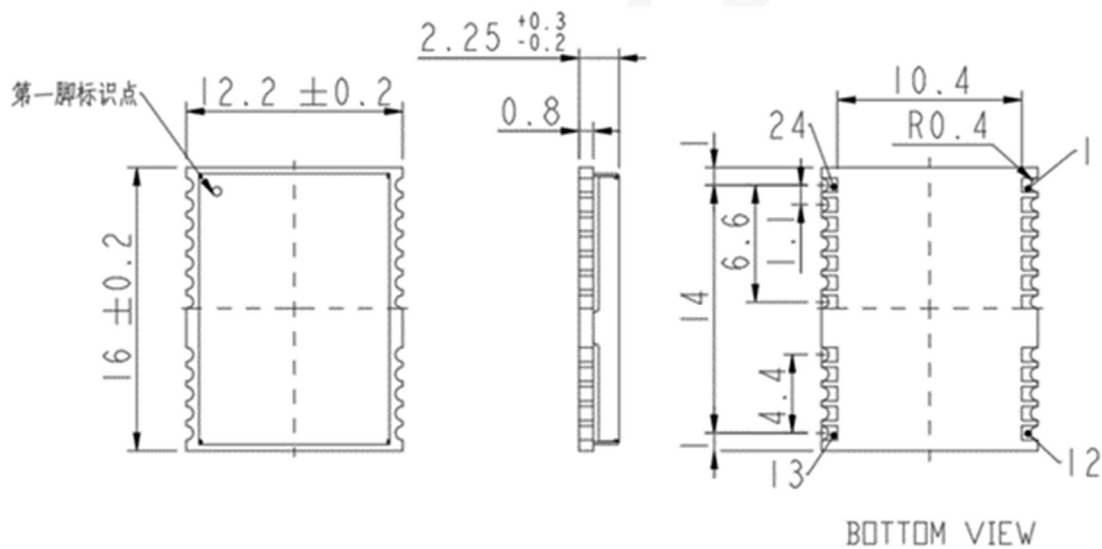


Figure 2. K801 Dimension View / K801 三视图

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

K801 module includes 24pin, surface mounted module, which can be integrated by users through definition.

K801 模块包括 24pin，表贴式模块，通过定义用户可自行集成。

13	GND3	GND2	12
14	GPIO2	ANT1	11
15	RXD2	GND1	10
16	TXD2	VCC_RF	9
17	RSV3	RESET_N	8
18	SDA	VDD_EXT	7
19	SCL	USB_DP	6
20	TXD1	USB_DM	5
21	RXD1	GPIO1	4
22	V_BACKP	PPS	3
23	VCC	RSV1	2
24	GND4	WAKEUP	1

Figure 3. Pin drawing of K801 Module(Front view)/K801模块引脚（正视图）

Table 2. Pin Definition of K801 24-Pin Pad / K801 24针脚焊盘的针脚定义

Pin	Signal	Type	Description	
1	WAKEUP	I	Wake up the module in Backup mode	Backup 模式中唤醒模块(1.8V)
2	RSV1	-	Reserved	保留
3	PPS	O	Pulse Per Second	秒脉冲
4	GPIO1	I/O	General-purpose input/output	通用IO
5	USB_DM	I/O	USB data	USB数据
6	USB_DP	I/O	USB data	USB数据
7	VDD_EXT	O	3.0V power output	3.0V电源输出,最大电流输出为100mA
8	RESET_N	I	RESET_N	复位
9	VCC_RF	O	Voltage for external RF	电流输出能力取决于 VCC 3.3V, 用于为外部有源天线供电, 不用则悬空
10	GND1	-	Ground Reference	参考地
11	ANT1	I	GNSS Positioning antenna	GNSS定位天线
12	GND2	-	Ground Reference	参考地

Pin	Signal	Type	Description	
13	GND3	-	Ground Reference	参考地
14	GPIO2	I/O	General-purpose input/output	通用IO
15	RXD2	I	UART2 input	串口2输入
16	TXD2	O	UART2 output	串口2输出
17	RSV3	-	Reserved	保留
18	SDA (SLV)	I/O	I2C Data	I2C数据
19	SCL (SLV)	I/O	I2C Clock	I2C时钟
20	TXD1	O	UART1 output	串口1输出
21	RXD1	I	UART1 input	串口1输入
22	V_BACKP	PWR	Backup supply voltage	RTC电源 (必须供电2.5~5.5V)
23	VCC	PWR	Voltage supply	电源输入
24	GND4	-	Ground Reference	参考地
With * features under development, currently not supported. 带*项功能开发中, 暂不支持				

Remarks: Please keep the reserved and unused pins hanging (not connected).

备注:预留和未使用的引脚请保持悬空(不连接)。

3.1. Remarks / 说明

1. Electrical Characteristics / 电气特性

COM1/2 (TX&RX), GPIO and PPS are LVCMOS 3.0V levels. All these signals are compatible with LVCMOS/LVTTL 3.0V.

COM1/2(TX&RX), GPIO, PPS 为 LVCMOS 3.0V 电平, 所有这些信号均兼容 LVCMOS/LVTTL 3.0V。

Table 3. LVCMOS 3.0V Electrical Standard / LVCMOS 3.0V电气标准

Symbols 符号	Description 描述	Min 最小	Max 最大
V _{IH}	Input high voltage 输入高电压	2.0V	VCC+0.3V
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	VCC-0.4V	--
V _{OL}	Low-level output voltage 低电平输出电压	--	0.41V
I _{OH}	Sourcing current 拉电流		4mA
I _{OL}	Sinking current		4mA

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灌电流

Table 4. LVTTTL 3.0V Electrical Standard / LVTTTL 3.0V电气标准

Symbols 符号	Description 描述	Min 最小	Max 最大
V_{IH}	Input high voltage 输入高电压	2.0V	VCC+0.3V
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	VCC-0.4V	--
V_{OL}	Low-level output voltage 低电平输出电压	--	0.41V
I_{OH}	Sourcing current 拉电流		4mA
I_{OL}	Sinking current 灌电流		4mA

2. Withstand Voltage Range / 能承受的电压范围

The signals that can withstand the voltage of 3.0V are as follows: COM1/2 (TX&RX), PPS;

所能承受电压为 3.0V 的信号如下: COM1/2(TX&RX), PPS;

The signals that can withstand the voltage of 1.8V are as follows: WAKEUP, RESET_ N.

所能承受电压为 1.8V 的信号如下: WAKEUP, RESET_N.

3. Supply Voltage / 供电电压

VCC main power supply, voltage range: 3.3V (DC). Voltage ripple and peak pulse shall be less than 50mV. Voltage ripple and peak pulse shall be less than 50mV. V_ BCKP, voltage 2.5V~5.5V, voltage ripple and peak pulse are required to be less than 30mV.

VCC 主供电电源, 电压范围: 3.3V~3.45V (直流)。电压纹波和尖峰脉冲要求小于50mV。电压纹波和尖峰脉冲要求小于50mV。V_BCKP, 电压2.5V~5.5V, 电压纹波和尖峰脉冲要求小于 30mV。

4. Add Surge Protection / 增加浪涌保护

In order to effectively protect against lightning strikes and surges, and prevent damage to the feed current limiting chip inside the module, it is recommended that users supply power to the antenna from outside the module and increase the surge protection function.

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.

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并增加浪涌保护功能。

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。

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

- 1) VCC power-on has a good monotonicity, and the initial level is lower than 0.4V, and the upstroke 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 50Ω impedance matching of the line;
- 4) 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;
- 5) 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 module.
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.
- 6) Antenna interface: The antenna line is as short and smooth as possible, avoiding acute angles; pay attention to 50Ω impedance matching;
- 7) Avoid wiring directly under K801;
- 8) 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，上冲与振铃保障在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50Ω阻抗匹配；
- 4) 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；
- 5) 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的电源芯片给模块供电。
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。
- 6) 天线接口：天线线路尽量短且顺畅，避免走锐角；注意50Ω阻抗匹配；
- 7) 避免在K801正下方走线；
- 8) 模块尽量远离高温气流。

6. Static Electricity Protection / 静电保护

Some components on K801 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 ANT_IN pin, do not touch any live capacitance or material (e.g., surface mount antenna, coaxial cable, wire iron, etc.) to avoid damage to the ANT_IN pin by the charge generated or stored by said capacitor or material;
- 10) Please make sure to solder the ANT_IN pin with an electrical protection iron.

K801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，请不要接触任何带电电容或材料（例如表贴天线、同轴电缆、电烙铁等），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烙铁焊接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

K801 is surface mounted, SMT welding is recommended for assembly.

K801为表贴式模块，推荐使用SMT的焊接方式进行装配。

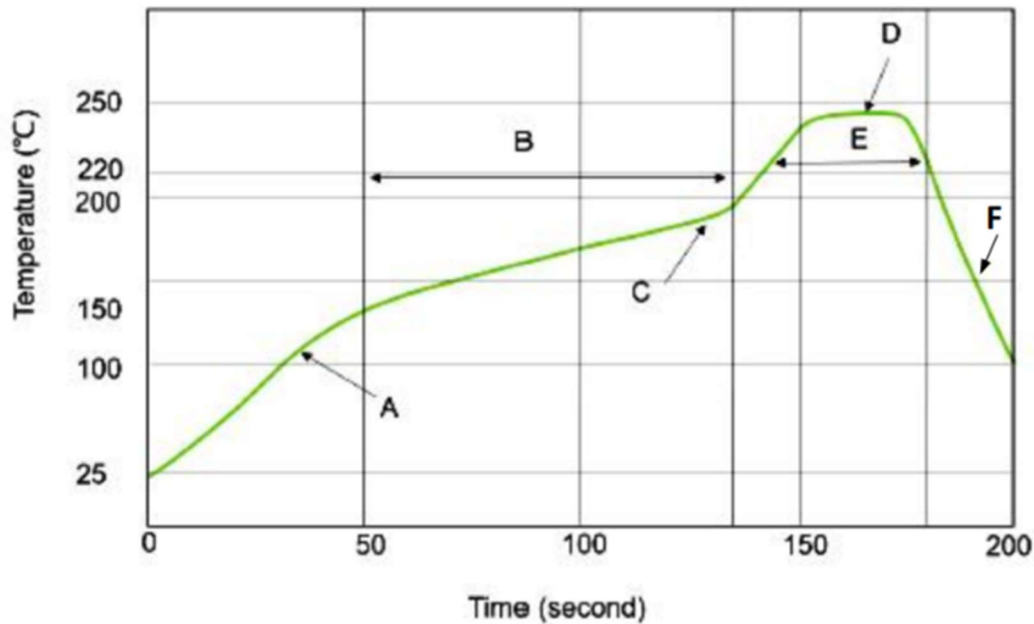


Figure 4. Furnace Temperature Curve / 炉温曲线

The process temperature limits are as follows:

- A: Heating Zone: Rising Slope: $1 \sim 3^{\circ}\text{C} / \text{sec}$
- B: Constant Temperature Zone: Range: $150 \sim 190^{\circ}\text{C}$ Time: $80 \sim 110\text{ S}$
- C: Constant Temperature \rightarrow Reflow Zone: Rising Slope: $1 \sim 3^{\circ}\text{C} / \text{sec}$
- D: Peak Temperature: $235 \sim 245^{\circ}\text{C}$
- E: Reflow Zone: Range: Over 220°C Time: $50 \sim 80\text{ S}$
- F: Descent Slope: $-5^{\circ}\text{C} \sim -1^{\circ}\text{C} / \text{sec}$

制程温度界限如下：

- A: 升温区：斜率： $1 \sim 3^{\circ}\text{C} / \text{sec}$
- B: 恒温区： $150 \sim 190^{\circ}\text{C}$ 时间： $80 \sim 110\text{S}$
- C: 恒温 \rightarrow 回流区：斜率： $1 \sim 3^{\circ}\text{C} / \text{sec}$
- D: 峰值温度： $235 \sim 245^{\circ}\text{C}$
- E: 回流区：大于 220°C 时间： $50 \sim 80\text{S}$
- F: 下降斜率： $-5 \sim -1^{\circ}\text{C} / \text{sec}$

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°C, rising slope under 3°C /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°C，升温斜率不超过3°C/s。

5. Application Connection Example / 应用连接示例

In this section, an application connection example of K801 OEM Module is presented via specific schematic diagrams. Per the instruction of these diagrams, you could easily build the communication circuits between K801 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K801模块应用连接示例。参照下面的图示，您可以很方便建立K801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。

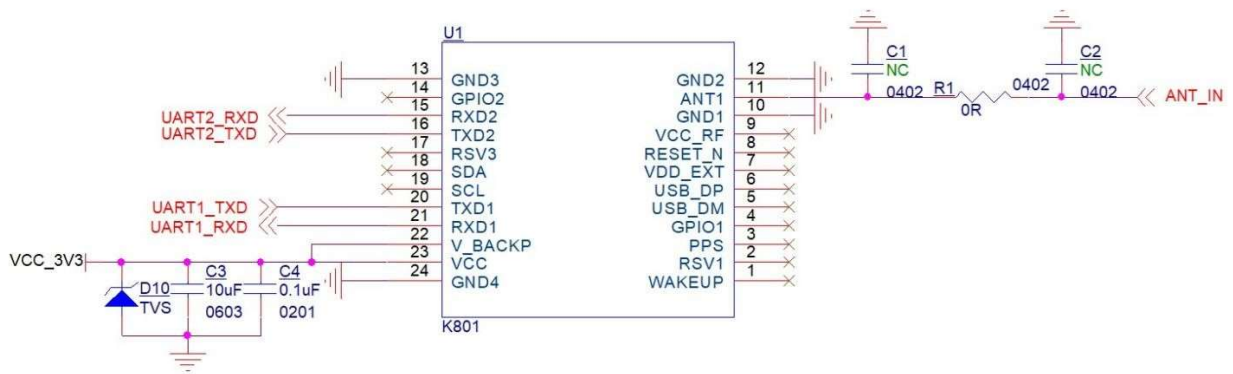


Figure 5. K801 module connection example (passive antenna connection mode)/K801模块连接示例（无源天线连接方式）

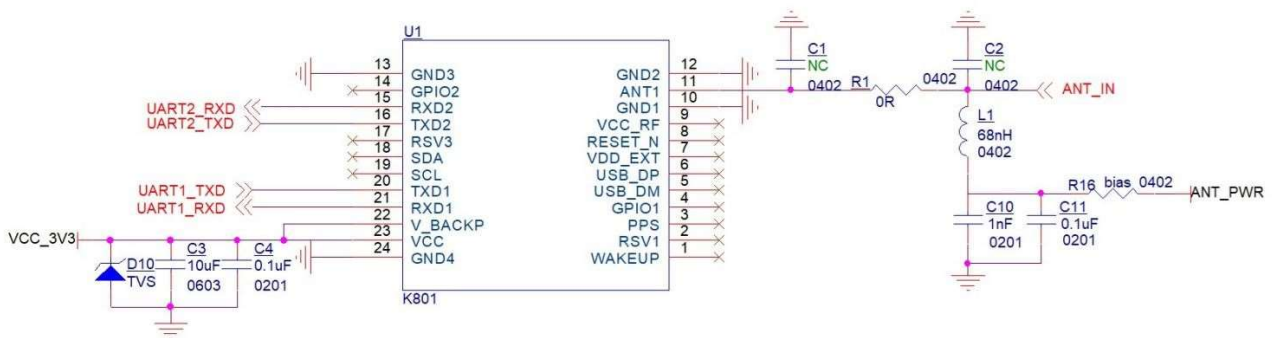


Figure 6. K801 module connection example (active antenna connection mode)/K801模块连接示例（有源天线连接方式）

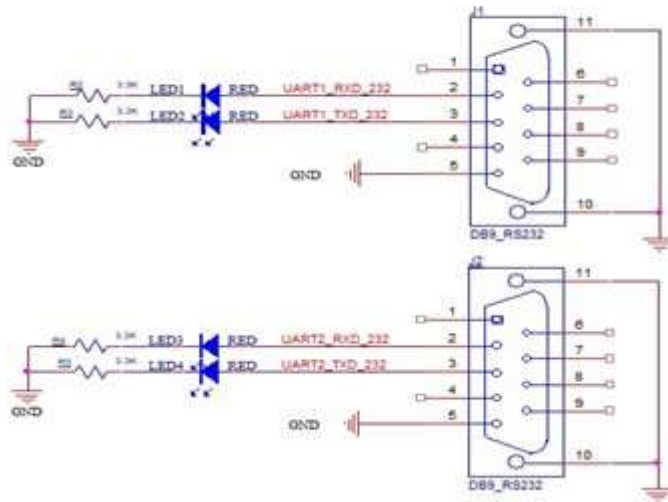


Figure 7. Example of connection between K801 RS232 COM1, 2 and other devices using UART interface / K801 RS232 COM1、2与其他使用UART接口的设备之间的连接示例

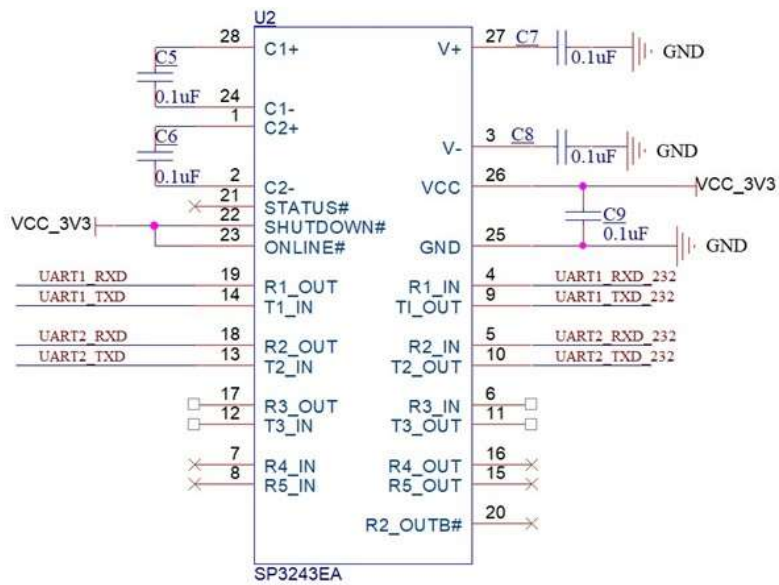


Figure 8. Example of COM serial port TTL to RS232 connection / COM串口TTL转RS232连接示例

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6. Package / 包装

K801 module is packaged in a vacuum-sealed aluminum foil electrostatic bag containing desiccant and moisture proof by means of carrier tape and coil (applicable to mainstream surface mount equipment). When welding modules by reflow soldering process, please strictly comply with IPC standards for humidity control of modules. Because the packing materials such as the carrier belt can only withstand 55°C, the modules need to be removed from the packaging during baking operation.

K801 模块使用载带、卷盘方式（适用于主流表面贴装设备），包装在真空密封的铝箔防静电袋中，内含干燥剂防潮。采用回流焊工艺焊接模块时，请严格遵守 IPC 标准对模块进行湿度管控。由于载带等包装材料只能承受 55°C，在进行烘烤作业时需要将模块从包装中取出。

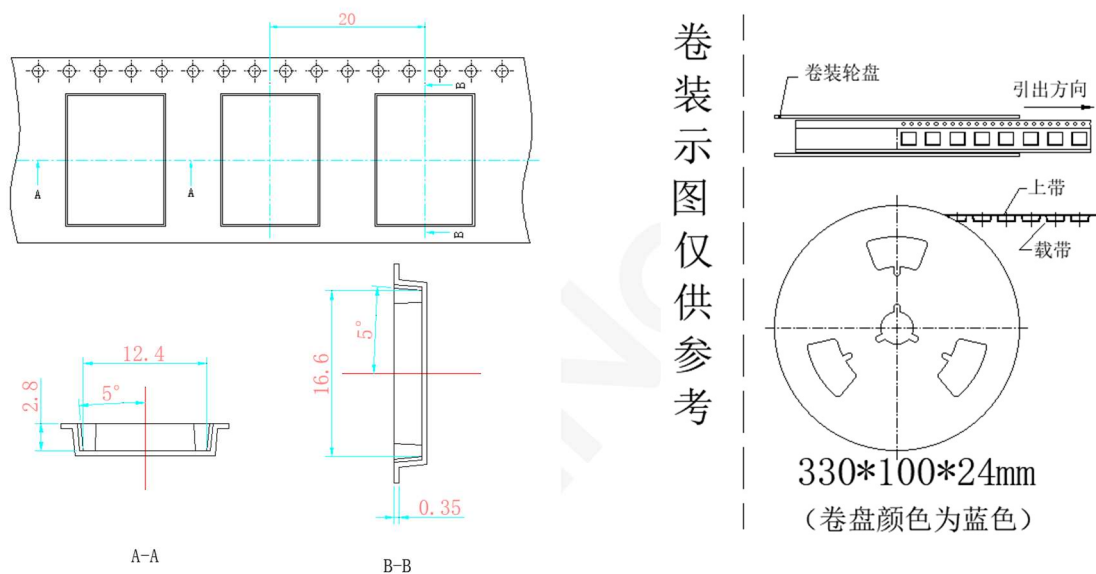


Figure 9. K801 Roll Tape Packing / K801 卷带包装

Table 5. K801 Package Description / K801 包装说明

Project	Description
Number of Modules 模块数量	500 Slice/Roll 500 片/卷
Reel Size 卷盘尺寸	Material tray:13 inches 料盘: 13 寸 Outer diameter: 330mm, inner diameter: 100mm, width: 24mm, wall thickness: 2.8mm

	外径 330mm, 内径 100mm, 宽 24mm, 壁厚 2.8mm
	Package of each module: length 16.6mm, width 12.4mm 每个模块包装: 长 16.6mm, 宽 12.4mm
Carrier Belt 载带	Module Spacing (Center Distance): 20mm 模块间距 (中心距) : 20mm

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