

# SKG172T规格书

## 北斗GPS授时型接收模块/ SKG172T Datasheet Beidou GPS Timing Receiving Module

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## 1 产品简介/Product Introduction

SKG172T 北斗 GPS 授时型接收模块,接收北斗卫星 B1 频点民码信号和 GPS 卫星 L1 频点 C/A 码信号,具有定位、定时功能及自主完好性监测功能,提供 1PPS (1Pulse Per Second) 秒脉冲信号和 PVT 信息输出。

SKG172T beidou GPS timing module receives beidou satellite B1 frequency point civil code signal and GPS satellite L1 frequency point C/A code signal. It has positioning, timing function and independent integrity monitoring function, and provides 1PPS (1Pulse Per Second) Second pulse signal and PVT information output.



图 1 SKG172T 产品图/Figure 1 SKG172T product diagram

## 2 典型应用/Applications

- ◆ 电力高精度授时/High precision timing of electricity
- ◆ 个人授时设备/Personal timing equipment
- ◆ 基站高精度授时/High precision timing of Base station
- ◆ 其他高精度授时/Other high precision timing

## 3 产品特点/Features

- ◆ 支持 BDS、GPS 系统/Supports BDS and GPS systems
- ◆  $\pm 10\text{ns}$  高精度脉冲 (PPS) / $\pm 10\text{ns}$  high precision pulse (PPS)
- ◆ PPS 与 NMEA 相关联/PPS is associated with NMEA
- ◆ 支持 1 个全双工 UART 串口/Supports one full-duplex UART serial port
- ◆ 工业级标准/Industrial standard
- ◆ 尺寸: 22.4x17mm (长 x 宽) /Dimensions: 22.4x17mm (l x W)
- ◆ 符合 RoHS,FCC,CE 标准/Complies with RoHS,FCC,CE standards

## 4 性能参数/Performance parameter

表 4-1 基本参数/Table 4-1 Essential parameter

参数/Parameter	性能指标/Performance index
电压/Voltage	2.85~3.45VDC
接收通道类型 /Receiving channel type	72 个捕获通道, 24 个跟踪通道, 支持北斗 B1 频点民码和 GPS L1 频点 C/A 码/72 capture channels, 24 tracking channels, support beidou B1 frequency point civil code and GPS L1 frequency point C/A code
数据接口/ data interface	1 个全双工 UART 串口, 波特率可设/ One full-duplex UART serial port with configurable baud rate
工作温度/ Operating temperature	-40°C ~ +80°C
存储温度/ Storage temperature	-40°C ~ +85°C
工作湿度/ Operating humidity	10%~95%, 非冷凝, @25°C

表 4-2 GNSS 性能指标/ Table 4-2 GNSS Performance index

参数/Parameter	描述/Description	性能指标/Performance index
首次定位时间/TTFF	冷启动/Cold Start	<28s
	热启动/Hot Start	<1s
	重捕获/Reacquisition	<1s
灵敏度/Sensitivity	接收/Reception	-147dBm
	跟踪/Tracking	-162dBm
精度/Precision	定位/Positioning	2.5mCEP
PPS		支持, 精度 10ns/ Supported, precision is 10ns
数据更新率/ Data updating rate		1Hz
导航数据格式 /Navigation data format		NMEA 0183

## 5 PIN 脚定义/PIN Definition

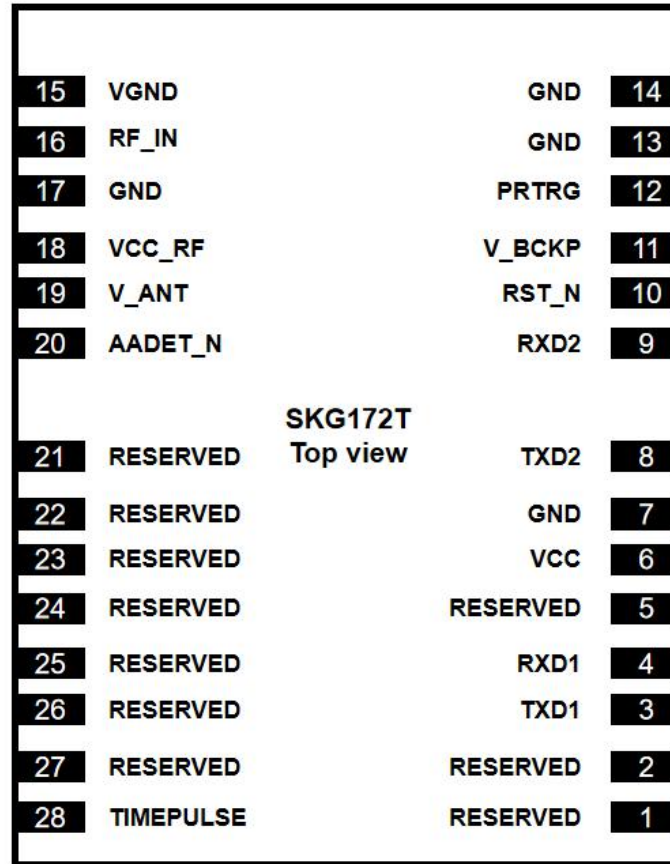


图 5-1 SKG172T 引脚定义/ Figure 5-1 SKG172T pin definitions

表 5-1 引脚定义/ Table 5-1 Pin definitions

引脚/Pin No.	引脚名称/Pin name	I/O	描述/Description	备注/Remark
1	RESERVED	I/O		保留/Retain
2	RESERVED	I/O		保留/Retain
3	TXD1	O		串口 1 输出/Serial Port 1 Output
4	RXD1	I		串口 1 输入/Serial port 1 Input
5	RESERVED	I/O		保留/Retain
6	VCC	I		电源/Power supply
7	GND	I		地/Ground
8	TXD2	O		调试串口输出, 不用时悬空/Debug serial port output, suspended when not in use
9	RXD2	I		调试串口输入, 不用时悬空/Debug serial port Input, suspended when not in use
10	RST_N	I		复位, 低平有效/Reset, low level effective

11	V_BCKP	I		备份电源/Backup power supply
12	PRTRG	I		BOOT 模式使能/BOOT mode Enable
13	GND	I		地/Ground
14	GND	I		地/Ground
15	GND	I		地/Ground
16	RF_IN	I		射频输入/Rf input
17	GND	I		地/Ground
18	VCC_RF	O		天线供电输出
19	V_ANT	I		天线供电输入
20	AADET_N	I		天线检测输入
21	RESERVED	I/O		保留/Retain
22	RESERVED	I/O		保留/Retain
23	RESERVED	I/O		保留/Retain
24	RESERVED	I/O		保留/Retain
25	RESERVED	I/O		保留/Retain
26	RESERVED	I/O		保留/Retain
27	RESERVED	I/O		保留/Retain
28	TIMEPULSE	O		1PPS 输出/Output 1 PPS

## 6 电气特性/Electrical specification

表 6-1 电气特性//Electrical specification

参数/Parameter	符号/Symbol	最小值/Min.	最大值/Max.	单位/Unit
供电电压(VCC)/Supply Voltage	VCC	-0.5	3.6	V
VCC 最大纹波/VCC maximum ripple	Vrpp	0	50	mV
工作电流范围/@3.3V/ Operating current range @3.3V		60	100	mA
天线供电电压/Antenna supply voltage	3.3	5	5.5	V
天线短路检测电流门限/Antenna short-circuit detection current threshold			260	mA
ESD	VESD(HBM)	--	500	V

## 7 传输及外设接口/Transport and peripheral interface

### 7.1 PPS

SKG172T 提供高精度的 1PPS 时标信号，其精度优于 10ns（95%，PDOP $\leq$ 4）。1PPS 信号正脉宽大于 2ms，1PPS 信号的上升沿为时间同步点，上升沿的上升时间小于 5ns。用户可通过时延设置命令调整 1PPS 相位。当授时有效后，TOD 信息首字符与 1PPS 上升沿距离大于 2ms。

The SKG172T provides a high-precision 1PPS time-scale signal with an accuracy better than 10ns (95%, PDOP $\leq$ 4). The positive pulse width of 1PPS signal is wider than 2ms, the rising edge of 1PPS signal is the time synchronization point, and the rising time of the rising edge is less than 5ns. The user can adjust the 1PPS phase by using the delay setting command. When timing is effective, the distance between the first character of TOD information and 1PPS rising edge is greater than 2ms.

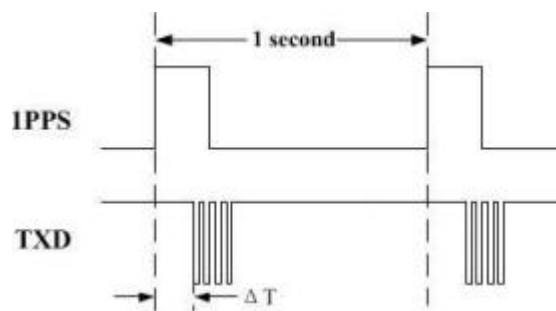


图 7-1 1PPS 与 TOD 时序/Figure 7-1 1PPS and TOD timing sequence

### 7.2 串口输入输出协议/Serial port I/O protocol

SKG172T 提供一个全双工 UART 串口，波特率可设，1 位起始位，8 位数据位，1 位停止位，NMEA0183 格式协议。用户可通过串口进行定时、定位模式设置，获取 PVT 信息和接收模块状态等信息。

SKG172T provides a full-duplex UART serial port with configurable baud rate, 1 bit start bit, 8 bit data bit, 1 bit stop bit, NMEA0183 format protocol. You can set timing and location mode through the serial port to obtain information such as PVT information and receiving module status.

## 8 硬件设计参考/Hardware Design Reference

### 8.1 接口设计参考/Interface Design Reference

图 8-1 是使用无源天线的最简化示意电路，图 8-2 和图 8-3 是使用有源天线的最简化示意电路。天线和模块的 RF\_IN 管脚连接时需要使用阻抗为 50 $\Omega$  的同轴电缆和同轴连接器，否则模块有可能接收不到信号。



Figure 8-1 shows the simplest schematic circuit using passive antenna, Figure 8-2 and Figure 8-3 show the simplest schematic circuit using active antenna. When connecting the antenna to the RF\_IN pin of the module, use a coaxial cable with an impedance of 50 Ω and a coaxial connector; otherwise, the module may not receive signals.

如果想要得到更好的卫星信号，可以在模块的 RF\_IN 前端加低噪声放大器和滤波电路，具体参数需要参考天线和模块的指标。

If you want to get a better satellite signal, you can add a low noise amplifier and filter circuit at the front end of the MODULE'S RF\_IN. The specific parameters need to refer to the indicators of the antenna and module.

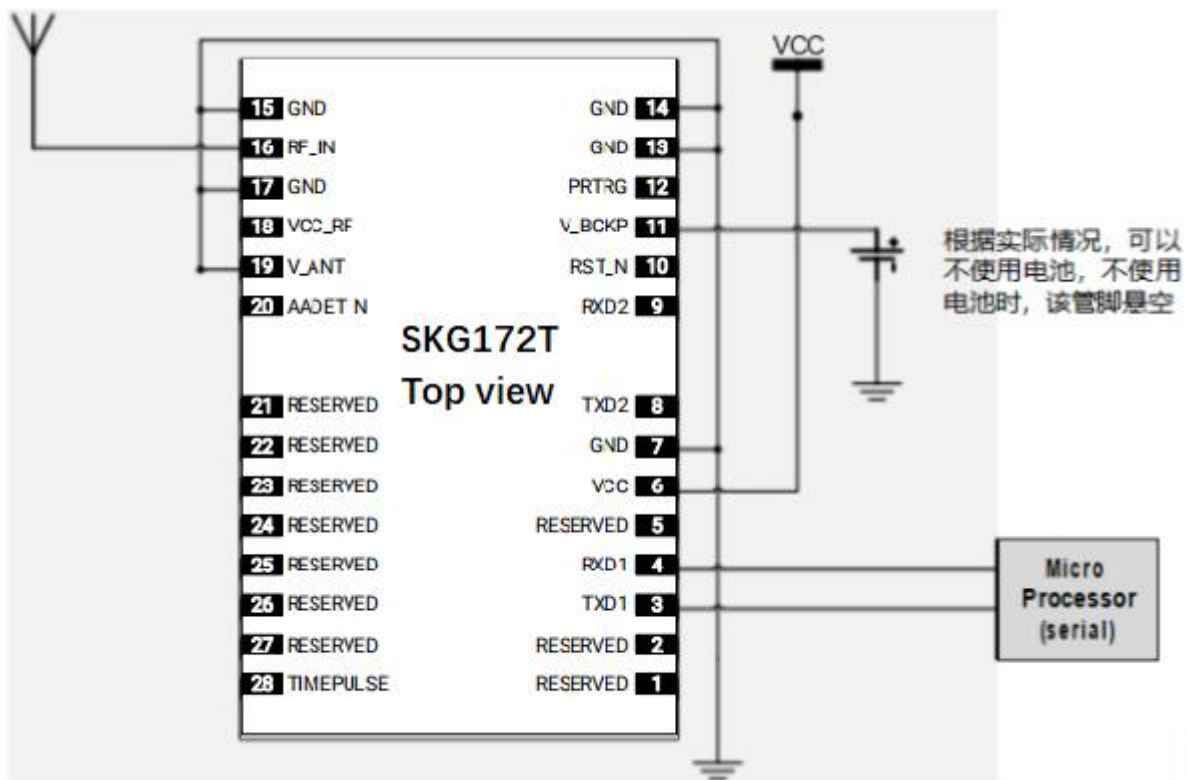


图 8-1 无源天线应用设计示意图/ Figure 8-1 Application design of passive antenna

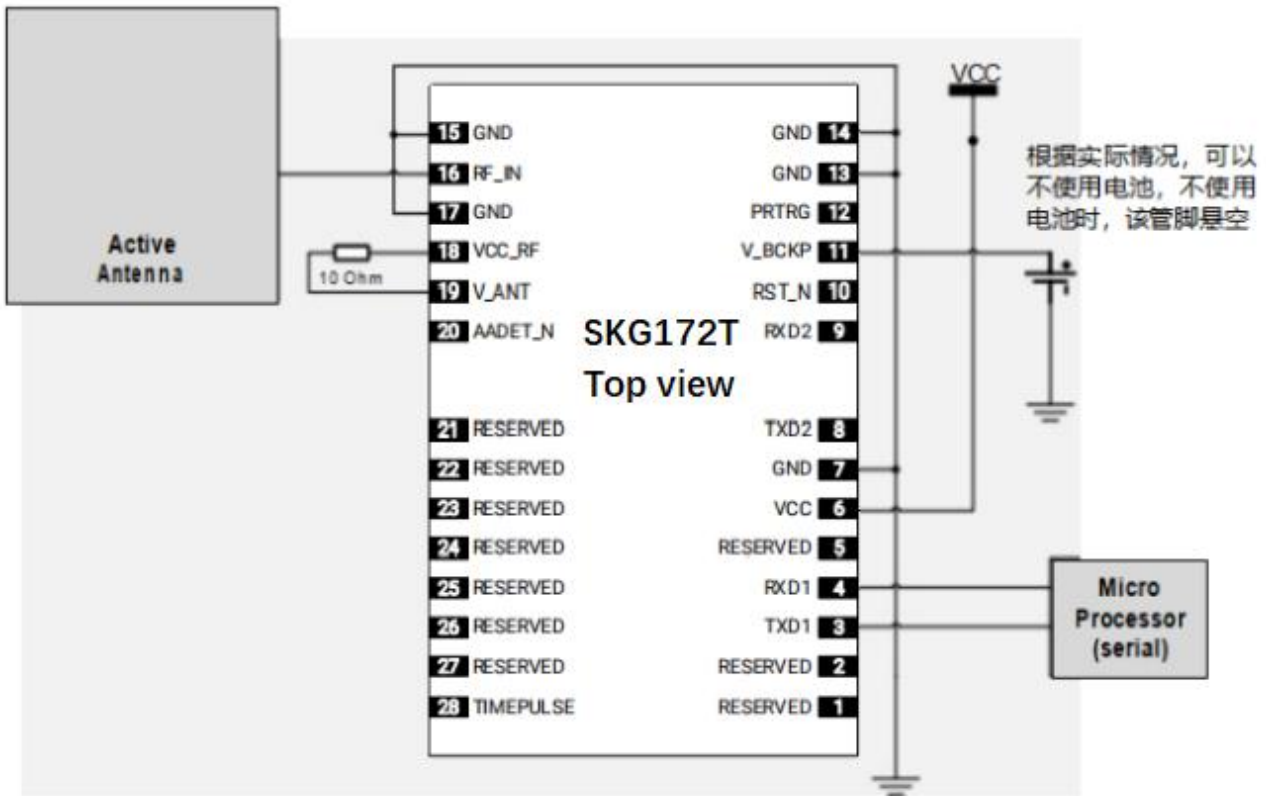


图 8-2 有源天线应用设计示意 A/ Figure 8-2 Application design of an active antenna A

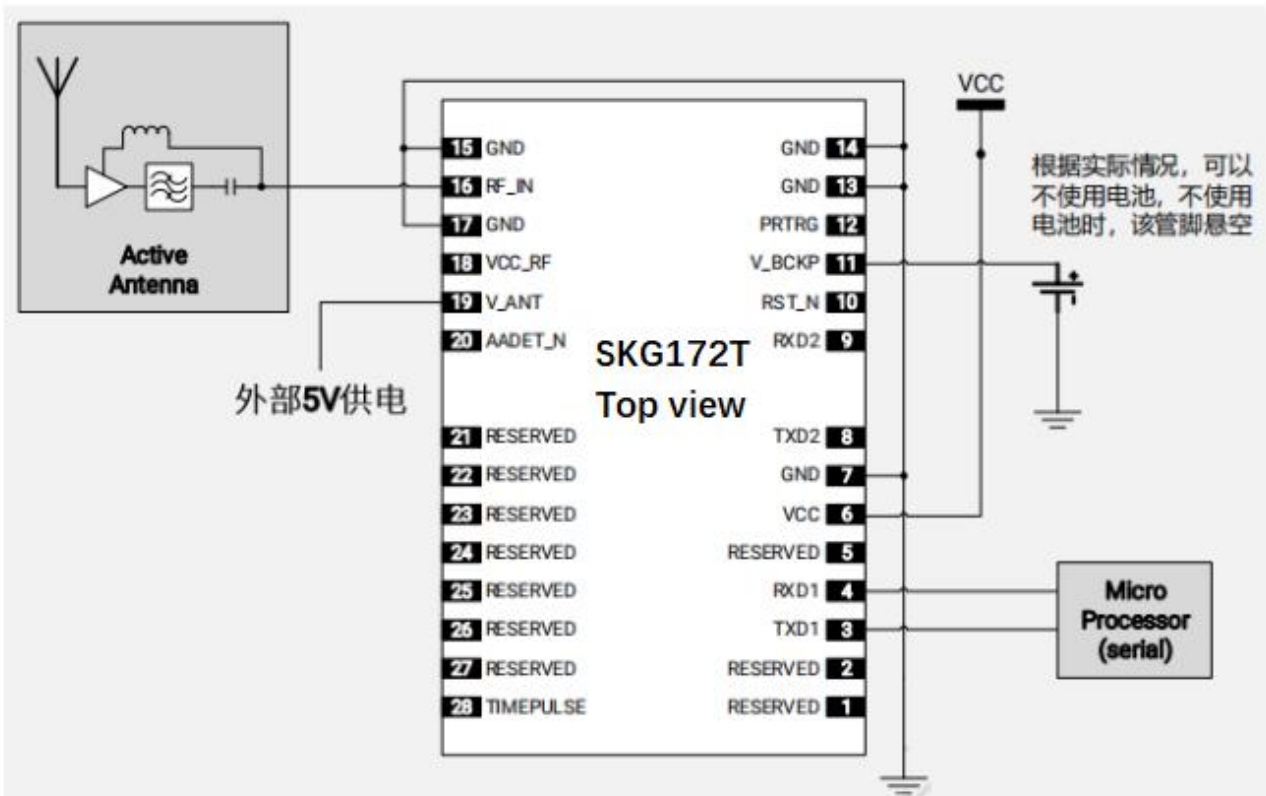


图 8-3 有源天线应用设计示意 B/ Figure 8-2 Application design of an active antenna B

## 8.2 开路检测电路/Open circuit detection circuit

仅适用于使用有源天线的应用。当有源天线处于开路状态或者没有连接有源天线时，检测电路输出一个高电平给模块的 AADET\_N。电路如下图所示：

Only applicable to applications using active antennas. When the active antenna is open or no active antenna is connected, the detection circuit outputs a high level to the module's AADET\_N. The circuit is shown in the figure below:

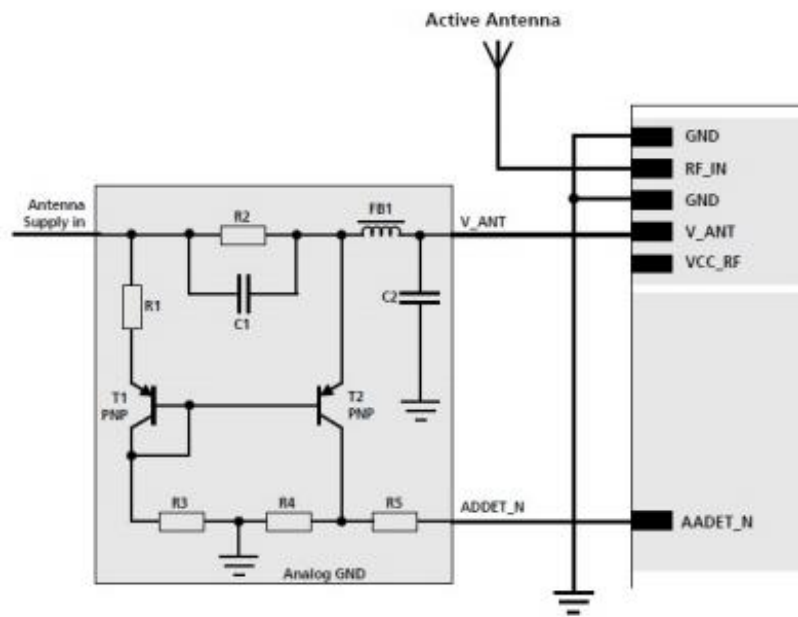
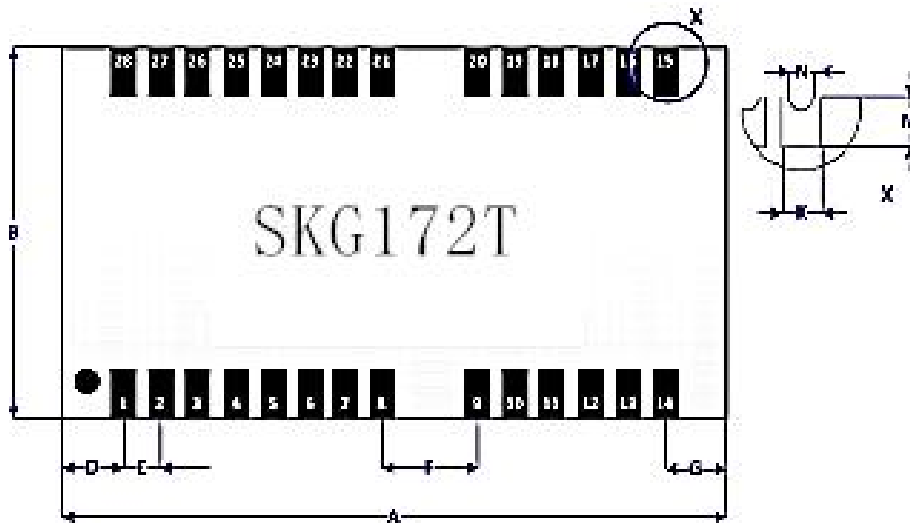


表 8-1 元器件参考表/Table 8-1 Component reference table

元件标号 /Designator	参考值 /Reference	精度/Accuracy	功能描述/Functional description
C1	2.2uF	±10%	瓷片电容，工作电压 10V 以上/ Ceramic capacitor, working voltage above 10V
C2	100nF	±10%	瓷片电容，工作电压 10V 以上/ Ceramic capacitor, working voltage above 10V
FB1	600Ω		磁珠/Magnetic bead
R1	15Ω	±10%	电阻，大于 0.05W / Resistance, greater than 0.05W
R2	10Ω	±10%	电阻，大于 0.25W / Resistance, greater than 0.25W

R3,R4	10kΩ	±10%	电阻, 大于 0.05W / Resistance, greater than 0.05W
R5	33kΩ	±10%	电阻, 大于 0.05W / Resistance, greater than 0.05W
T1,T2	S8550		PNP 型三极管/PNP semiconductor triode

## 9 机械尺寸/Machine dimension



参数	典型值(mm)	参数	典型值(mm)
A	22.4	G	2.85
B	17.0	K	0.8
D	2.55	M	1.0
E	1.1	N	0.5
F	3.8		

图 9-1 外形尺寸/Figure 9-1 External dimensions

## 9.1 Layout 注意事项/Layout Precautions

- 射频信号微带线因该越短越好，尽可能的缩短天线与 RF\_IN 的微带线。射频信号不应有长于 2 厘米的没有屏蔽的微带线。

The microstrip line of RF signal should be as short as possible, and the microstrip line of antenna and RF\_IN should be shortened as possible. Rf signals should not have unshielded microstrip lines longer than 2cm.

- 尽量避免射频信号穿过数字信号区域。

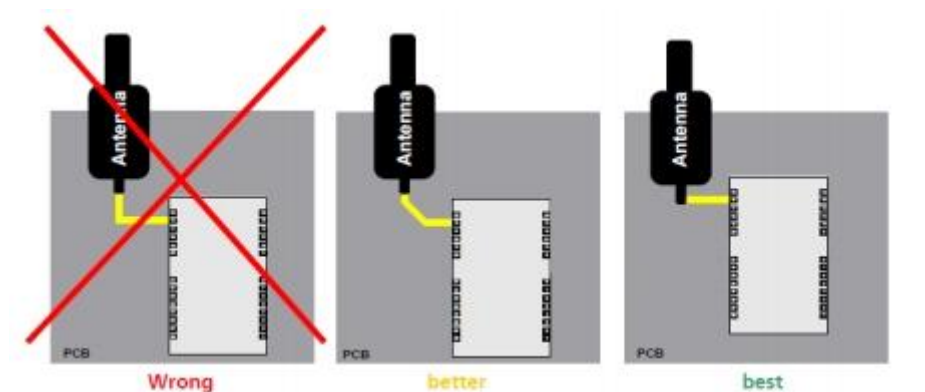
Avoid RF signals passing through the digital signal area.

- 建议使用 4 层以上的 PCB，射频信号尽量少走过孔，并且尽量在一层进行布线，地层应该靠近射频走线层。

It is recommended to use more than 4 layers of PCB, RF signal through the hole as little as possible, and try to wire in the first layer, the ground should be close to the RF wiring layer.

- 射频信号输入的信号流向应该尽量避免尖锐的拐角和多余的分叉，最大程度减少信号的损耗。天线与模块 RF\_IN 连线的参考如下图所示。

Rf signal input signal direction should avoid sharp corners and redundant bifurcation as far as possible to minimize signal loss. The reference of the connection between antenna and module RF\_IN is shown in the figure below.



## 10 包装规格/Packing specification

模块采用卷带包装，每卷 500 片。/ The modules are packed in rolls with 500 pieces per roll.

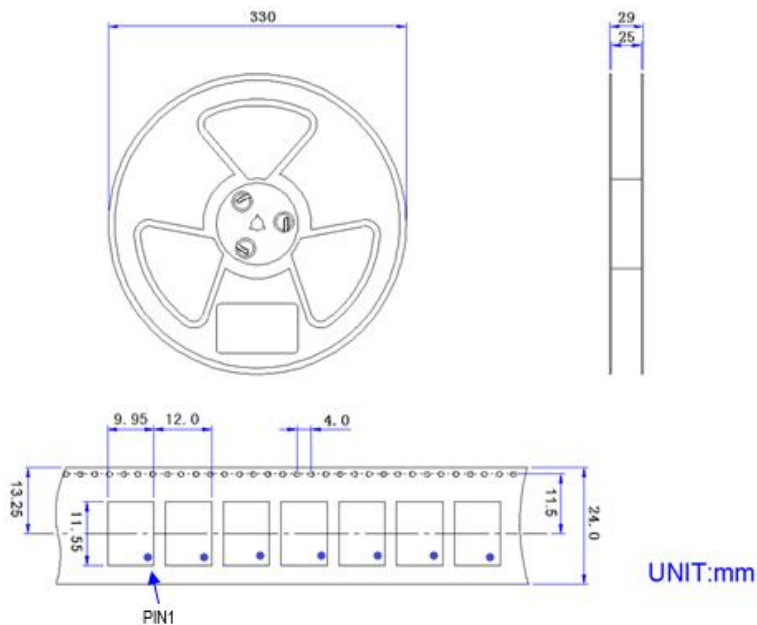


图 10-1 SKG172T 包装图/Figure 10-1 SKG172T package

## 11 贴片建议/Patch advice

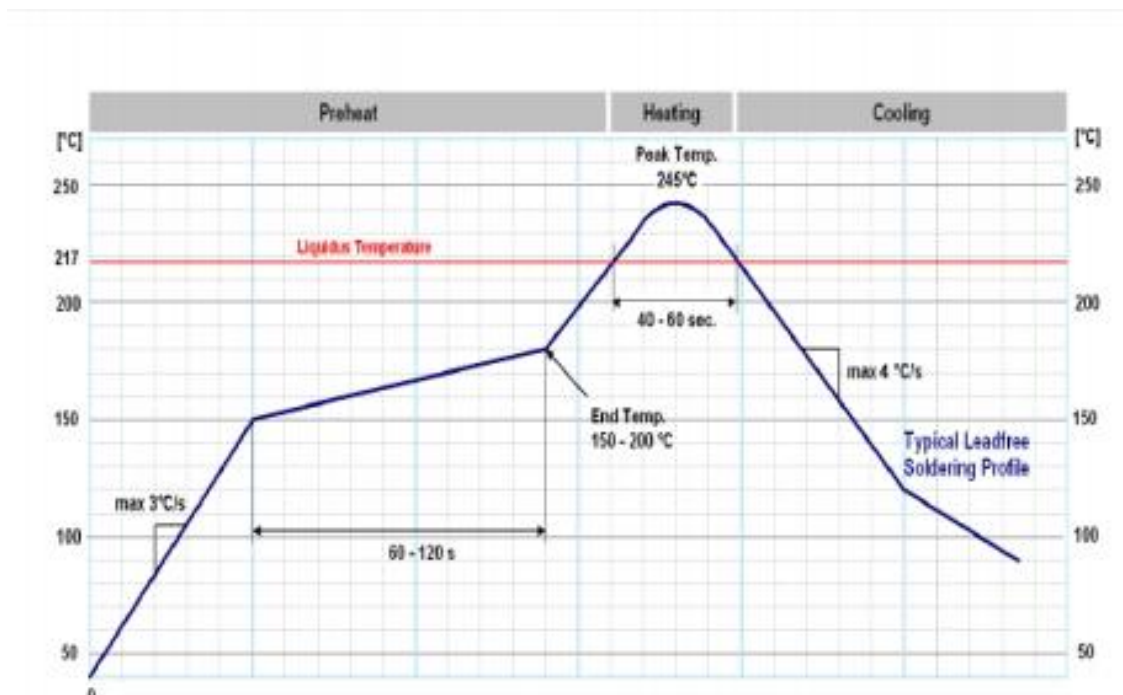


图 11-1 SKG172T 推荐炉温曲线/Recommended furnace temperature curve

**Melting Temperature:217°C**

**Stencil Thickness:150um**

## 12 联系方式/Contact Information

### **Skylab M&C Technology Co.,Ltd.**

深圳市天工测控技术有限公司

地址:深圳市龙华区龙华街道工业东路利金城科技工业园 9#厂房 6 楼

Address: 6 Floor, No.9 Building, Lijincheng Scientific&Technical park, Gongye East Road, Longhua

District, Shenzhen, Guangdong, China

电话/Phone: 86-75583408210 (Sales Support)

电话/Phone: 86-75583408510 (Technical Support)

传真/Fax: 86-755-83408560

邮箱/E-Mail: [technicalsupport@skylab.com.cn](mailto:technicalsupport@skylab.com.cn)

网站/E-Mail: [www.skylab.com.cn](http://www.skylab.com.cn) [www.skylabmodule.com](http://www.skylabmodule.com)