

SKG1223规格书

北斗三号定位模块

SKG1223 Datasheet Beidou 3 Positioning Module

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1 产品简介/Product introduction

SKG1223 是一款高性能的导航定位模块，模块支持北斗三号的卫星信号接收，使定位更快，精度更高，产品性能更可靠。

SKG1223 is a high-performance navigation and positioning module, which supports the satellite signal reception of Beidou3, making positioning faster, higher accuracy and more reliable product performance.

该模组以其卓越性能，可以为车载和便携式等定位终端产品的制造提供了高灵敏度、高精度、低成本

的定位、导航等解决方案，能满足专业定位的严格要求与个人消费需要。
With its excellent performance, the module can provide positioning and navigation solutions with high sensitivity, high precision and low cost for the manufacturing of vehicle and portable positioning terminal products, which can meet the strict requirements of professional positioning and personal consumption needs.

外形尺寸紧凑，兼容市场上国际主流导航定位模块，采用 SMD 焊盘，支持标准取放及回流焊接。
The module is compact in shape, compatible with the international mainstream navigation and positioning modules in the market, using SMD pad, support standard take and put and reflow welding.



图 1: SKG1223 正视图/Top view

2 典型应用/Applications

- ◆ 汽车导航/Auto navigation
- ◆ 个人导航设备/Personal navigation equipment
- ◆ 汽车保全系统/Car Security System
- ◆ 车辆监控/Vehicle monitoring

3 产品特点/Product feature

- ◆ 支持 BDS 系统/Supports BDS system
- ◆ 支持跟踪卫星数量达 40 颗/Support the number of tracking satellites up to 40
- ◆ 极快的 TTFF: 冷启动小于 28s; 热启动小于 1s/ Extremely fast TTFF: cold start less than 28s; Hot start less than 1s
- ◆ 支持 A-GPS/ Support A-GPS
- ◆ 工业级标准/Industrial Grade Standards
- ◆ 超小尺寸/Super small size: 16.0x12.2x2.4mm
- ◆ 符合 RoHS, FCC, CE 标准/ Compliance with RoHS, FCC, CE standards
- ◆ 获得最快的定位时间/Get the fastest location time
- ◆ 弱信号下较好的定位精度和位置有效性/Better positioning accuracy and position validity are maintained under weak signal
- ◆ 优越的质量和可靠性/Superior quality and reliability

4 性能参数/Performance parameter

表 4-1 基本参数/Table 4-1 Basic parameter

| 参数/Parameter | 描述/Describe | 性能指标/Performance evaluation |
|--------------------------|-------------------------|---|
| 电压/Voltage | | 3.0~3.6V |
| 射频输入/RF Input | 频率/ frequency | BDS: B1I/B1C/B2A 北斗三号/Beidou3: B1I (1 5 6 1 . 0 9 8 M H z) B1C (1 5 7 5 . 4 2 M H z) B2a (1 1 7 6 . 4 5 M H z) |
| | 驻波比/Standing-wave ratio | ≤1.5 |
| | 输入阻抗/Input impedance | 50Ω±10% |
| | 天线增益/Antenna Gain | 0~32dB |
| 物理尺寸/Physical Size | | 16.0*12.2*2.4 (单位: mm) |
| 数据接口/ Data interface | | 1 个 UART, TTL 电平,波特率 1200~460800bps 可调, 默认 115200 / One UART, TTL level, baud rate adjustable from 1200 to 460800bps, 115200 by default. |
| 天线检测/ Antenna testing | | 可支持天线馈电, 需外置天线检测电路/ support antenna feed, need external antenna detection circuit |

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

| 参数/Parameter | 描述/Describe | 性能指标/Performance evaluation |
|---|-----------------------|-----------------------------|
| 首次定位时间 TTFF/ First positioning time TTFF | 冷启动/Cold Start | ≤28s |
| | 热启动/Hot Start | ≤1s |
| | 重捕获/Re-Acquisition | ≤1s |
| 灵敏度/Sensitivity | 跟踪/Tracking | -162dBm |
| | 捕获/Acquisition | -148dBm |
| 精度/precision | 定位/Position | <2.5m |
| | 速度/Speed | 0.1m/s |
| 动态性能/dynamic performance | 速度/Speed | 515m/s |
| | 加速度/accelerated speed | 4g |
| PPS | | 支持/Support |
| 数据更新率/data updating rate | | 1Hz~5Hz 默认/Default: 1Hz |
| 导航数据格式/Navigation data format | | NMEA 0183 V4.0 版 |

5 PIN 脚定义/PIN Definition

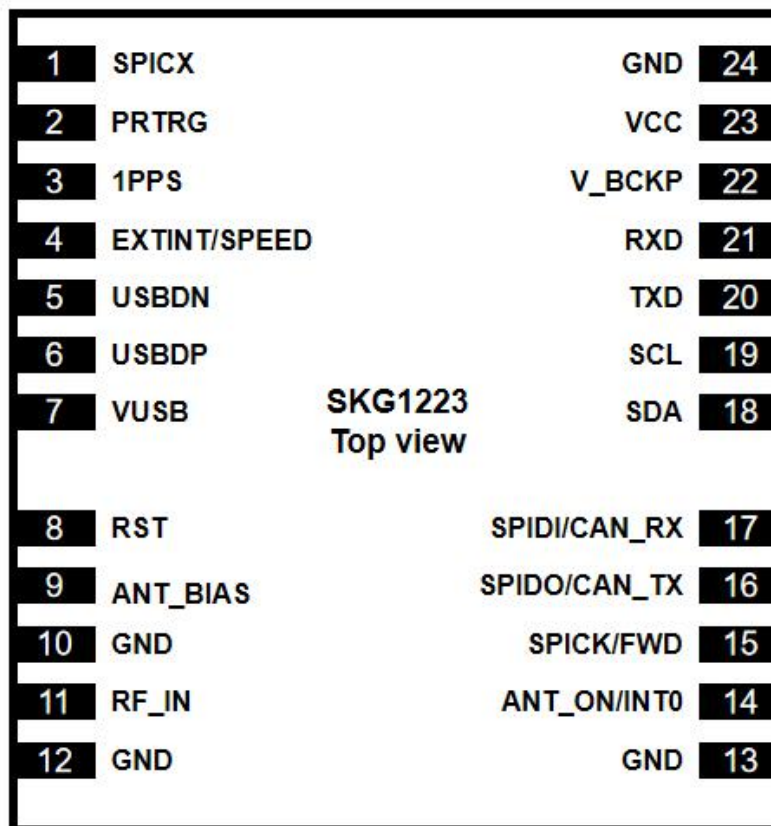


图 5-1 SKG1223 引脚定义/PIN Definition

表 5-2 引脚定义/Table 5-2 PIN Definition

| 编号 /NO. | 管脚名称/ Pin Names | I/O | 描述/Describe | 备注/Remark |
|------------|--------------------|-----|---|---|
| 1 | SPICX | O | SPICX, SPI 片选 | |
| 2 | PRTRG | I/O | 通用 IO | |
| 3 | 1PPS | O | 秒脉冲输出/Second pulse output | 不用则悬空。/If not, hang. |
| 4 | EXTINT/SPEED | I | 外在中断/External interrupt | 不用则悬空。/If not, hang. |
| 5 | USBDN | I/O | USB_DN | |
| 6 | USBDP | I/O | USB_DP | |
| 7 | VUSB | I | USB 3.3V 供电电源 | |
| 8 | RST | I | RESET, 内部有上拉 | 不用则悬空。/If not, hang. |
| 9 | ANT_BIAS | O | 天线供电电压输出 (检测负载电流 2mA~20mA) /Antenna power supply voltage output (load current detection 2mA~20mA) | 如需要天线开短路检测, 则必须使用该引脚给有源天线供电 This pin must be used to supply power to the active antenna if antenna short circuit detection is required |
| 10 | GND | G | 地/Ground | |
| 11 | RF_IN | I | 天线输入/Antenna input | 输入端需要做 50Ω阻抗匹配。/ 50Ω impedance matching is required at the input |
| 12 | GND | G | 地/Ground | |
| 13 | GND | G | 地/Ground | |
| 14 | ANT_ON/INT0 | I/O | ANT_EN, 有源天线电压控制输出;也可配置成输入中断 ANT_EN, active antenna voltage control output; It can also be configured as input interrupt | |
| 15 | SPICK/FWD | O | SPI 时钟 | |
| 16 | SPIDO/CAN_TX | O | SPI 输出, 或者 CAN 发射端/ SPI output, or CAN transmitter end | |
| 17 | SPIDI/CAN_RX | I | SPI 输入, 或者 CAN 接收端/ SPI input, or CAN receiver | |
| 18 | SDA | I/O | DDC 接口的数据信号/ Data signals of DDC interfaces | |
| 19 | SCL | I/O | DDC 接口的时钟信号/ Clock signal of the DDC | |

| | | | | |
|----|--------|---|---|-----------|
| | | | interface | |
| 20 | TXD | O | 串口发送 (NMEA 数据输出、状态输出等) /Serial port transmission (NMEA data output, status output, etc.) | |
| 21 | RXD | I | 串口接收 (控制命令接收) /Serial port reception (control command reception) | |
| 22 | V_BCKP | I | 备份电源/Backup power supply | 2.0V~3.6V |
| 23 | VCC | I | 主电源/main power supply, 3.3V | |
| 24 | GND | G | 地/Ground | |

6 电气特性/Electrical characteristics

6.1 极限值/limit value

表 6-1 电源特性/Table 6-1 Features of the power supply

| 参数/Parameter | 符号/Symbol | 最小值/Min. | 最大值/Max. | 单位/Unit | 条件/Condition |
|---------------------------------|-----------|----------|----------|---------|--------------|
| 供电电压 (VCC) | VCC | -0.5 | 3.6 | V | -- |
| VCC 最大纹波/ VCC Maximum Ripple | Vrpp | 0 | 50 | mV | -- |
| 输入管脚电压/Input pin voltage | Vin | -0.5 | 3.6 | V | -- |
| 存储温度/Storage Temperature | Tstg | -40 | 85 | °C | -- |
| ESD | VESD(HBM) | -- | 2000 | V | All pins |

6.2 运行条件/Operating Condition

表 6-2 运行条件/Table 6-2 Operating conditions

| 参数/Parameter | 符号/Symbol | 最小值/Min. | 典型值/Type | 最大值/Max. | 单位/Unit |
|-------------------------------|-----------|----------|----------|----------|---------|
| 供电电压(VCC) | Vcc | 3.0 | 3.3 | 3.6 | V |
| RTC 供电电压(VRTC) | Vrtc | 2.0 | 3.0 | 3.6 | V |
| 峰值电流/Peak Current | Iccp | | | 53 | mA |
| 输入管脚低电平/Input pin low level | Vin_low | 0 | | 0.2*Vcc | V |
| 输入管脚高电平/Input pin high level | Vin_high | 0.67*Vcc | | VCC | V |
| 输出管脚低电平/Output pin low level | Vout_low | | | 0.4 | V |
| 输出管脚高电平/Output pin high level | Vout_high | 2.64 | | | V |
| 工作温度/operating temperature | | -40 | | 85 | °C |
| 存储温度/Storage Temperature | | -40 | | 125 | °C |

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

7.1 PPS

秒脉冲（PPS）：SKG1223 提供非常精准的时间脉冲 PPS 信号，PPS 信号可为外部系统提供授时功能，脉冲宽度可调，精度 20nS，默认情况下每秒输出一个脉冲。

Second pulse (PPS) : SKG1223 provides very precise time pulse PPS signal, PPS signal can provide timing function for external systems, pulse width adjustable, accuracy 20nS, output one pulse per second by default.

7.2 I2C（预留，可定制）/ I2C (Reserved, Customizable)

I2C 接口用于串行数据传输，可以工作在 Master/Slave 模式。/ The I2C interface is used for serial data transmission and can work in Master/Slave mode.

支持 7 位和 10 位寻址模式/ Support 7bit and 10bit addressing modes

支持 100K 的标准模式和 400K 的快速模式/ Supports 100K standard mode and 400K fast mode

支持 Msater 下的 DMA 数据移动/ Support DMA data movement under Msater

7.3 UART

支持数据传输、固件升级功能，输入/输出信号类型为 LVTTTL 电平。默认波特率为 115200bps，最高可设为 460800bps，串口波特率均可由用户自行配置。

Supports data transmission and firmware upgrade. The input/output signal type is LVTTTL level. The default baud rate is 115200bps and the highest baud rate is 460800bps. The baud rate of the serial port can be set by users.

7.4 GPIO（预留，可定制）/ GPIO(Reserved, Customizable)

预留 1 个通用 GPIO 接口，可由用户灵活配置。

One universal GPIO port is reserved for flexible configuration.

7.5 EXTINT（预留，可定制）/ EXTINT(Reserved, Customizable)

提供 1 个外部中断信号输入管脚。如果不使用，该信号可以悬空。

Provides an external interrupt signal input pin. If not used, the signal can be suspended.

7.6 SPI（预留，可定制）/ SPI(Reserved, Customizable)

预留 1 个 SPI 接口，可以工作在 Master/Slave 模式，支持公共 SPI 协议，同时也支持 I2C 音频协议（只支持输出）。

One SPI interface is reserved to work in Master/Slave mode and support the common SPI protocol and I2C audio protocol (only output).

7.7 USB（预留，可定制） / USB(Reserved, Customizable)

预留一个 USB 接口 2.0 FS 版本兼容接口(仅限设备), 可以作为通信的代替 UART 或其他通信接口。

Reserve a USB interface 2.0 FS compatible interface (only for devices), which can replace UART or other communication interfaces for communication.

支持 USB 2.0 速率最高为 12Mbps/ Support USB 2.0 speed up to 12Mbps

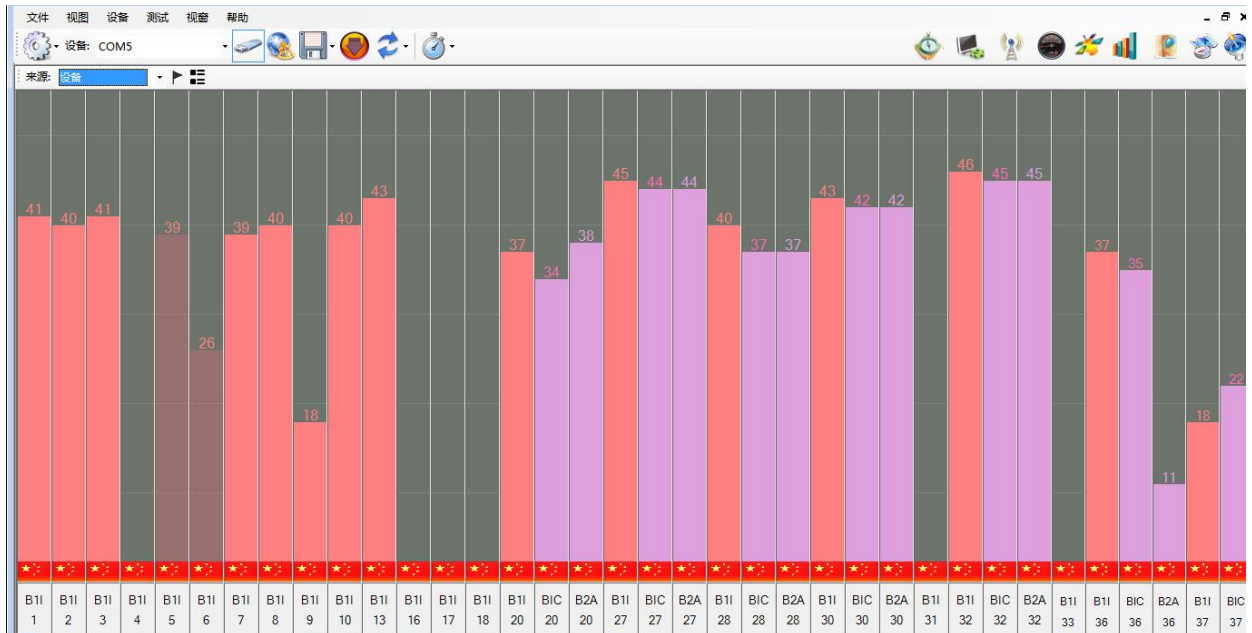
支持 windows XP/7/8/10, Android, Linux 操作系统/ Supports Windows XP/7/8/10, Android, and Linux operating systems

8 默认配置/ Default Configuration

| 消息类型/Message Type | 参数名/parameter name | 默认配置/ Default Configuration | 说明/Description |
|---------------------------|--------------------|--------------------------------|----------------|
| NMEA 消息/ NMEA messages | RMC | 1 | 1Hz 输出/Output |
| | GGA | 1 | 1Hz 输出/Output |
| | GSA | 1 | 1Hz 输出/Output |
| | GSV | 1 | 1Hz 输出/Output |
| | ZDA | 1 | 1Hz 输出/Output |

SKG1223 模块默认支持/ SKG1223 module supported by default:

BeiDou: B1I, B1C, B2a,



9 天线开短路检测/ Antenna Disconnection And Short-circuit Detection

SKG1223 支持天线开短路检测，模块 ANT_BIAS 天线负载电流范围 0~20mA。

SKG1223 supports antenna disconnection and short-circuit detection, and the module ANT_BIAS antenna load current range of 0~20mA.

检测负载电流 0~2mA 时，检测状态为开路。/ When the load current is 0 to 2mA, the detection state is disconnection.

检测负载电流 2~20mA 时，检测状态为正常。/ When the load current is 2 ma to 20mA, the detection status is normal.

检测负载电流 45mA 以上时，检测状态为短路，会暂时关闭使用。/ When the load current is detected above 45mA, the detection state is short-circuit, and the operation will be temporarily shut down.

10 软件说明/Software Specifications

10.1 NMEA 0183 协议/ NMEA 0183 Protocol

NMEA-0183 输出信息/ Nmea-0183 Output information

| NMEA 协议/ NMEA protocol | 描述/Description | 默认/Default |
|---------------------------|---|------------|
| GGA | 定位数据信息/Location data information | 打开/Turn on |
| GSA | 当前卫星信息/Current satellite information | 打开/Turn on |
| GSV | 可见卫星信息/Visible satellite information | 打开/Turn on |
| RMC | 推荐定位信息/Recommended Location Information | 打开/Turn on |
| ZDA | 时间和日期信息/Time and date information | 打开/Turn on |

10.2 GGA-定位数据信息/GGA- Location Data Information

此语句包含定位位置、定位时间、定位精度。

This statement contains location, location time, and location accuracy.

\$BDGGA,103958.000,2238.33997,N,11403.08962,E,1,16,0.72,96.3,M,-2.2,M,,*56

表 10.2-1 GGA 语句格式/ Table 10.2-1 GGA statement formats

| 名称/Name | 示例/Example | 单位/Unit | 描述/Description |
|--|-------------|---------|--|
| 语句 ID/Statement ID | \$BDGGA | | 表明语句为 GGA 信息 |
| UTC 时间 | 103958.000 | | hhmmss.sss 时分秒格式 |
| 纬度/Latitude | N/S | | N=北纬 S=南纬/ N=Northern latitude S=South latitude |
| 纬度/Latitude | 2238.33997 | | ddmm.mmmm 度分格式 |
| 经度/Longitude | E/W | | E=东经 W=西经/ E=East Longitude W=West Longitude |
| 经度/Longitude | 11403.08962 | | dddmm.mmmm 度分格式 |
| 定位状态/ Positioning state | 1 | | 见附表 10.2-2/ See the table 10.2-2 |
| 已使用卫星数量/ Number of satellites in use | 16 | | 范围 0 到 24/ The range is 0 to 24 |
| HDOP 水平精度因子 /HDOP horizontal precision factor | 0.72 | | |
| 海拔高度/ Level | 96.3 | 米/M | |
| 大地水准面高度 /Geoidal height | -2.2 | 米/M | |
| 校验值/Proof test value | *56 | | |
| EOL | <CR> <LF> | | 结束标志符/ End identifier |

表 10.2-2 定位状态描述/ Table 10.2-2 Location status description

| 数值/Value | 描述/Description |
|----------|---|
| 0 | 未定位或定位信息不可用/ No location or location information is unavailable |
| 1 | SPS 模式/ SPS model |
| 2 | GNSS, SPS 模式/ GNSS, SPS model |
| 3 | PPS 模式/ PPS model |

10.3 GSA-当前卫星信息/ GSA- Current satellite information

此条语句包含模块的选定工作模式，定位类型，已使用卫星的 PRN 信息及 PDOP, HDOP, VDOP 等信息。

This statement contains the selected working mode of the module, positioning type, PRN information of the used satellite, PDOP, HDOP, VDOP and other information.

\$BDGSA,A,3,210,203,232,227,208,213,207,202,201,230,228,205,1.17,0.72,0.92,4*06

\$BDGSA,A,3,206,220,236,209,,,,,,,,,1.17,0.72,0.92,4*0A

表 10.3-1 GSA 语句格式/ Table 10.3-1 GSA statement formats

| 名称/Name | 示例/Example | 单位/ Unit | 描述/Description |
|--|------------|----------|---|
| 语句 ID/ Statement ID | \$BDGSA | | 表明语句为 GSA 信息 |
| 模式 1/ Mode 1 | A | | 表 10.3-3/ Table 10.3-3 |
| 模式 2/ Mode 2 | 3 | | 表 10.3-2/ Table 10.3-2 |
| 已使用卫星 ID 信息/ ID information about the satellite in use | 206 | | 第一信道的 Sv 信息/Sv information of the first channel |
| 已使用卫星 ID 信息/ ID information about the satellite in use | 220 | | 第二信道的 Sv 信息/Sv information of the second channel |
| ... | ... | | ... |
| 已使用卫星 ID 信息/ ID information about the satellite in use | <Null> | | 十二信道的 Sv 信息（未使用则为空）/Sv information for twelve channels (null if not in use) |
| PDOP | 1.17 | | 综合位置精度因子/ Synthesize position accuracy factor |
| HDOP | 0.72 | | 水平精度因子/ Horizontal accuracy factor |
| VDOP | 0.92 | | 垂直精度因子/ Vertical precision factor |
| 校验值/Proof test value | 4*0A | | |
| EOL | <CR> <LF> | | 结束标志符/ End identifier |

表 10.3-2/ Table 10.3-2

| 值/Value | 描述/Description |
|---------|-----------------------|
| 1 | 未定位/ Not locate |
| 2 | 2D 定位/The 2D position |
| 3 | 3D 定位/ 3D positioning |

表 10.3-3/ Table 10.3-3

| 值/Value | 描述/Description |
|---------|--|
| M | 手动选择 2D 或者 3D 模式/ Manually select 2D or 3D mode |
| A | 自动选择 2D 或者 3D 模式/ Automatically select 2D or 3D mode |

10.4 GSV-可见卫星信息/ GSV- Visible satellite information

此语句包含可见卫星的 PRNs, 方位角和仰角等信息。

This statement contains PRNs, azimuth and elevation of the visible satellite.

\$BDGSV,9,1,35,210,65,227,40,203,64,190,42,232,61,175,48,632,61,175,45*61

\$BDGSV,9,2,35,882,61,175,45,227,55,28,46,627,55,28,44,877,55,28,43*51

\$BDGSV,9,3,35,231,52,97,,208,51,349,40,213,50,309,44,207,50,179,39*53

\$BDGSV,9,4,35,202,47,237,40,201,46,123,41,218,41,286,,204,33,109,*6A

\$BDGSV,9,5,35,230,28,322,44,630,28,322,41,880,28,322,41,228,25,91,38*53

\$BDGSV,9,6,35,628,25,91,36,878,25,91,36,205,23,256,39,206,17,161,27*66

\$BDGSV,9,7,35,216,14,168,,220,11,206,35,870,11,206,38,620,11,206,36*68

\$BDGSV,9,8,35,236,8,288,33,886,8,288,0,636,8,288,35,237,8,188,14*5B

\$BDGSV,9,9,35,637,8,188,23,209,6,186,19,233,1,36,*68

表10.4-1 GSV 语句格式/ Table 10.4-1 GSV statement formats

| 名称/Name | 示例/Example | 单位/ Unit | 描述/Description |
|---|------------|---------------|---|
| 语句 ID/ Statement ID | \$BDGSV | | 表明此语句为 GSV 信息/ Indicates that the statement is GSV information |
| GSV 总数信息/Indicates the total number of GSVs | 9 | | 本次 GSV 语句的总条数/ Total number of GSV statements |
| GSV 条数信息 | 1 | | 本条语句为 GSV 语句中的第几条/ Order in GSV statements |
| 可见卫星信息/ Visible satellite information | 35 | | 当前可见卫星总数/ Total number of currently visible satellites |
| 卫星 ID/ Satellite ID | 210 | | |
| 卫星仰角/ Satellite elevation angle | 65 | 度 /Degrees | 范围 00 到 90/ The range is 00 to 90 |
| 卫星方位角/ Satellite Azimuth | 227 | 度 /Degrees | 范围 000 到 359/ The range is 000 to 359 |
| 信噪比(C/NO) | 40 | dB-Hz | 范围 00 到 90 (未使用则为空) / Range 00 to 90 (null if not in use) |
| ... | | | ... |
| 卫星 ID/ Satellite ID | 632 | | |

| | | | |
|--------------------------------|-----------|------------|---|
| 卫星仰角 Satellite elevation angle | 61 | 度 /Degrees | 范围 00 到 90/ The range is 00 to 90 |
| 卫星方位角/ Satellite Azimuth | 175 | 度 /Degrees | 范围 000 到 359/ The range is 000 to 359 |
| 信噪比(C/NO) | 45 | dB-Hz | 范围 00 到 90 (未使用则为空) / Range 00 to 90 (null if not in use) |
| 校验值/Proof test value | *61 | | |
| EOL | <CR> <LF> | | |

10.5 RMC-推荐定位信息/RMC- Recommended Location Information

此语句包含推荐定位的卫星定位信息。

This statement contains satellite location information for the recommended location.

\$BDRMC,103958.000,A,2238.33997,N,11403.08962,E,0.001,136.92,210421,,A*4D

表 10.5-1: RMC 语句格式/ Table 10.5-1: RMC statement formats

| 名称/Name | 示例/Example | 单位/ Unit | 描述/Description |
|------------------------------------|-------------|-------------|--|
| 语句 ID/ Statement ID | \$BDRMC | | 表明此语句为 RMC 信息/ Indicates that the statement is RMC information |
| UTC 时间 | 103958.000 | | hhmmss.sss |
| 使用状态/ User state | A/V | | A=数据已使用 V=数据未使用/ A= Data in use V= Data not in use |
| 纬度/Latitude | 2238.33997 | | ddmm.mmmm 度分格式 |
| 纬度/Latitude | N/S | | N=北纬 S=南纬/ N=Northern latitude S=South latitude |
| 经度/Longitude | 11403.08962 | | ddmm.mmmm 度分格式 |
| 经度/Longitude | E/W | | E=东经 W=西经/ E=East Longitude W=West Longitude |
| 速度/Speed | 0.001 | 节/Paragraph | |
| 方位角/Azimuth | 136.92 | 度/Degrees | |
| UTC 日期 | 210421 | | ddmmyy |
| 磁偏角/Declination | <Null> | 度/Degrees | 未使用则为空/Null if not in use |
| 磁偏角方位/Magnetic declination azimuth | <Null> | | E=东经 W=西经/ E=East Longitude W=West Longitude |
| 定位模式/ Positioning Mode | A | | A=自动, N=未定位, D=DGPS, E=DR/ A= automatic, N= unlocated, D=DGPS, E=DR |
| 校验值/Proof test value | *4D | | |
| EOL | <CR> <LF> | | 结束标志符/ End identifier |

10.6 ZDA-当前时间信息/ ZDA- Current time information

此语句包含当前时间信息。

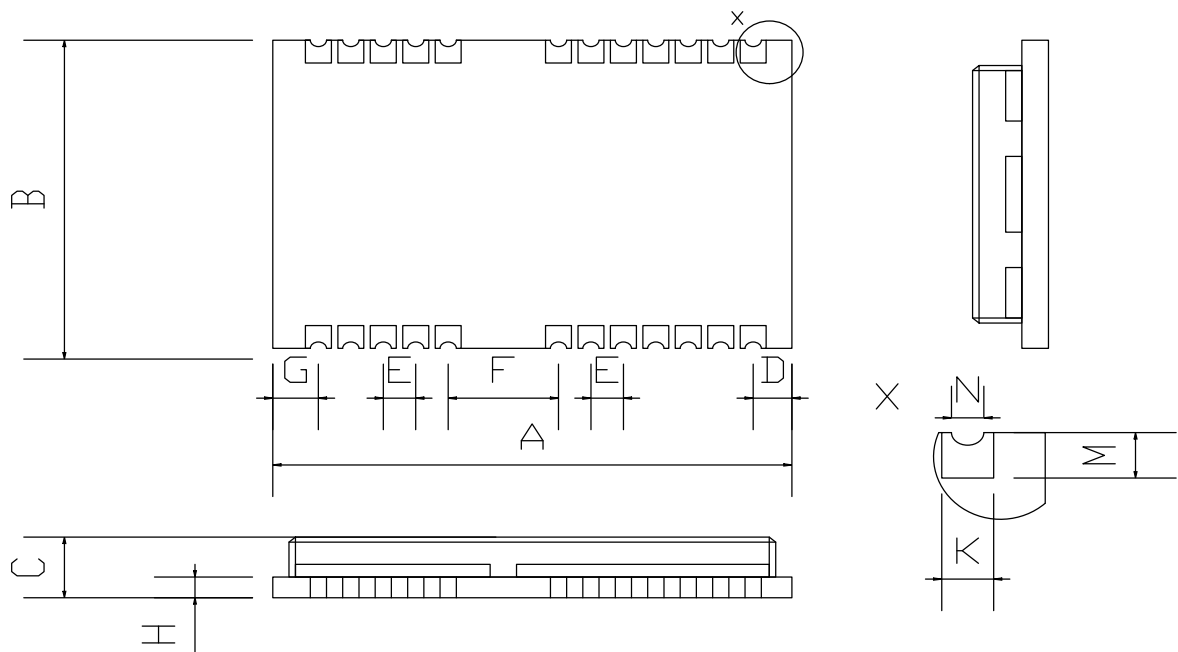
This statement contains the current time information.

\$BDZDA,103958.000,21,04,2021,00,00*47

表 10.6-1: ZDA 语句格式/ Table 10.6-1: ZDA statement formats

| 名称/Name | 示例/Example | 单位/ Unit | 描述/Description |
|--|------------|----------|---|
| 语句 ID/ Statement ID | \$BDZDA | | 表明此语句为 ZDA 信息/ Indicates that the statement is ZDA information |
| UTC 时间/ UTC time | 103958.000 | | hhmmss.sss |
| UTC 日期/ UTC date | 21 | | 日/ day |
| UTC 日期/ UTC date | 04 | | 月/ Month |
| UTC 日期/ UTC date | 2021 | | 年/ Year |
| 本地时区的小时/ Hours of the local time zone | 00 | | 默认为 00/ Default is 00 |
| 本地时区的分钟/ Minutes of the local time zone | 00 | | 默认为 00/ Default is 00 |
| 校验值/Proof test value | 47 | | |
| EOL | <CR> <LF> | | 结束标志符/ End identifier |

11 机械尺寸/Machine Dimension



| Symbol | Min.(mm) | Typ.(mm) | Max.(mm) |
|--------|----------|----------|----------|
| A | 16.0 | 16.3 | 16.6 |
| B | 12.0 | 12.2 | 12.4 |
| C | 2.2 | 2.4 | 2.6 |
| D | 0.9 | 1.0 | 1.3 |
| E | 1.0 | 1.1 | 1.2 |
| F | 2.9 | 3.0 | 3.1 |
| G | 0.9 | 1.0 | 1.3 |
| H | | 0.8 | |
| M | 0.8 | 0.9 | 1.0 |
| N | 0.4 | 0.5 | 0.6 |
| K | 0.7 | 0.8 | 0.9 |
| Weight | 1.6g | | |

图 11-1 外形尺寸/ Figure 11-1 External Dimensions

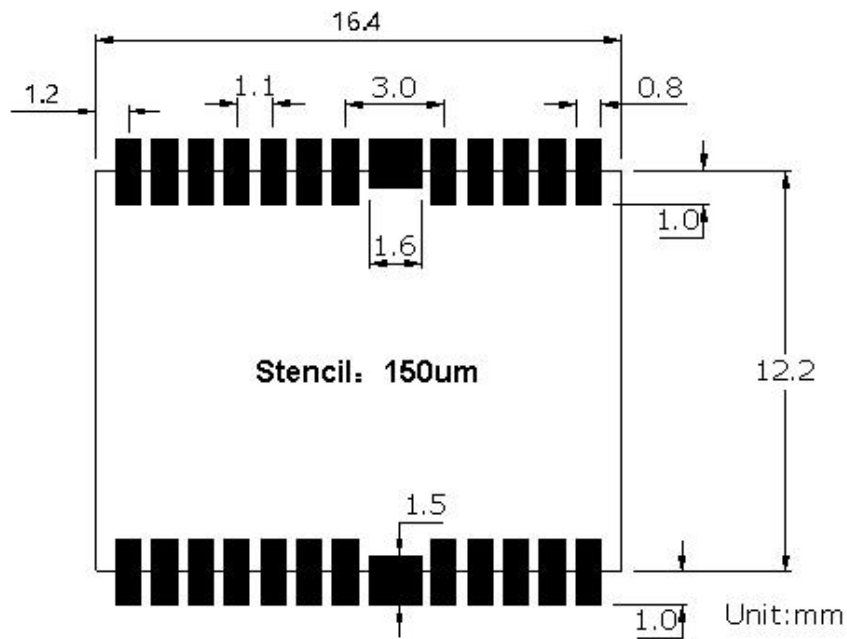


图 11-2 参考封装尺寸/ Figure 11-2 Refer to package dimensions

11.1 Layout 注意事项/ Layout Precautions

1) 元件布局/ Placing Components

GNSS 模块在 PCB 上的布局对于获得最佳的 GNSS 性能来说是至关重要的。与天线的连接应越短越好，避免对信号造成过大的衰减。在系统板设计上，要确保射频电路跟其他数字电路严格分开，将模块远离 PCB 上的数字区域。同时还必须将 GNSS 模块远离发热量较大的区域。

The layout of GNSS modules on the PCB is critical for achieving optimal GNSS performance. The connection with the antenna should be as short as possible to avoid excessive attenuation of the signal. In the system board design, ensure that RF circuits are strictly separated from other digital circuits and that modules are kept away from the digital area on the PCB. At the same time, GNSS modules must be kept away from areas with high heat.

2) 无源天线设计/ Passive Antenna Design

天线馈线的长度应尽可能短，且无源天线的下方要有一块完整的地。建议无源天线与 GNSS 模块放在 PCB 板相对的另一面。

The length of the antenna feeder should be as short as possible, and the passive antenna should have a complete ground below. It is recommended that the passive antenna and GNSS module be placed on the opposite side of the PCB board.

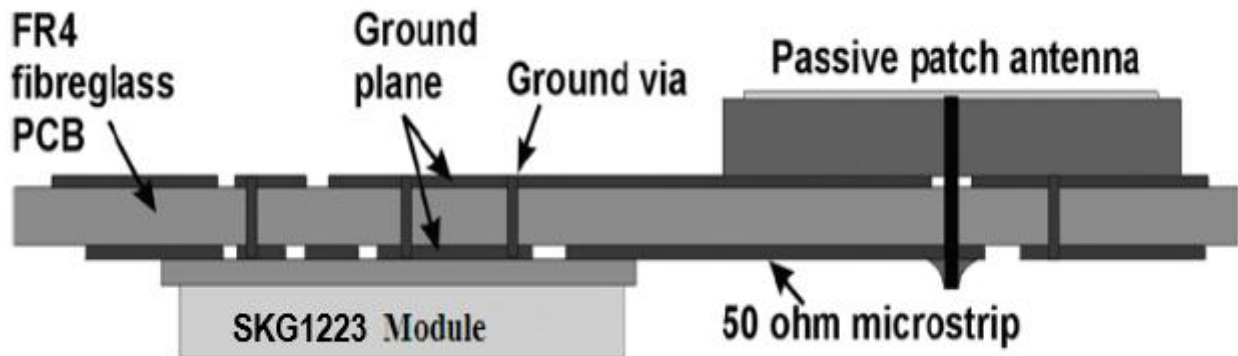


图 11.1-1 SKG1223 参考设计/ Figure 11.1-1 SKG1223 reference design

3) 阻抗匹配/ Impedance Matching

天线馈线的阻抗需为 50 Ohm，为了达到 50 Ohm 的阻抗，微带线的宽度 W 要根据导线和参考面的距离 H ，PCB 介质板的介电常数 ϵ_r ，以及 PCB 的结构来选择。

The impedance of the antenna feeder shall be 50 Ohm. In order to achieve the impedance of 50 Ohm, the width W of the microstrip line shall be selected according to the distance H between the wire and the reference plane, the dielectric constant ϵ_r of the PCB dielectric board, and the structure of the PCB.

4) 微带线设计/ Microstrip line design

微带线的长度应该尽可能的短，标准 PCB 上应该尽量不选用超过 2.5 cm (1 inch) 而又没有屏蔽层的微带线；

The length of microstrip lines should be as short as possible, and no microstrip lines exceeding 2.5cm (1 inch) without shielding layer should be selected on standard PCB as far as possible.

射频连接线的走线应避免靠近数字信号线；

Avoid routing RF cables close to digital signal cables.在连接地平面时要采用尽可能多的过孔；

布线应远离噪声源，如:开关电源，数字信号，晶振，处理器等；

Wiring should be far away from noise sources, such as switching power supply, digital signal, crystal oscillator, processor, etc.

微带线相对应的参考地层应保持完整；

The reference strata corresponding to the microstrip line should be kept intact.

微带线特性阻抗必须为 50 ohm；

The characteristic impedance of microstrip line must be 50 ohm;

为了减小信号衰减，微带线走线时要避免锐角。

In order to reduce signal attenuation, the acute Angle should be avoided when microstrip lines are routed.

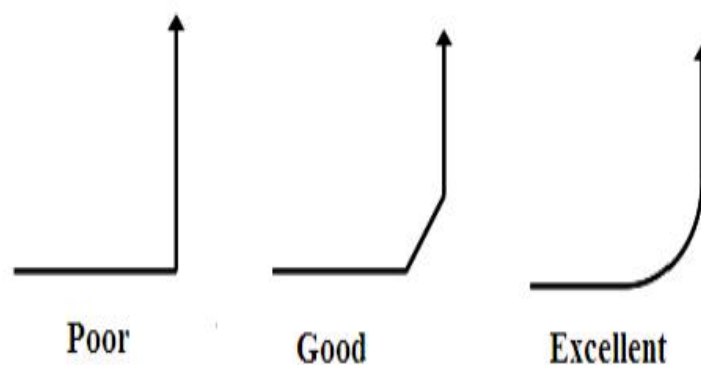


图 11.1-2 SKG1223 微带线设计推荐/ Figure 11.1-2 SKG1223 microstrip cable design

12 包装规格/ Packing Specifications

模块采用卷带包装，每卷 1200 片。

The module is packaged in rolls with 1200 pieces per roll.

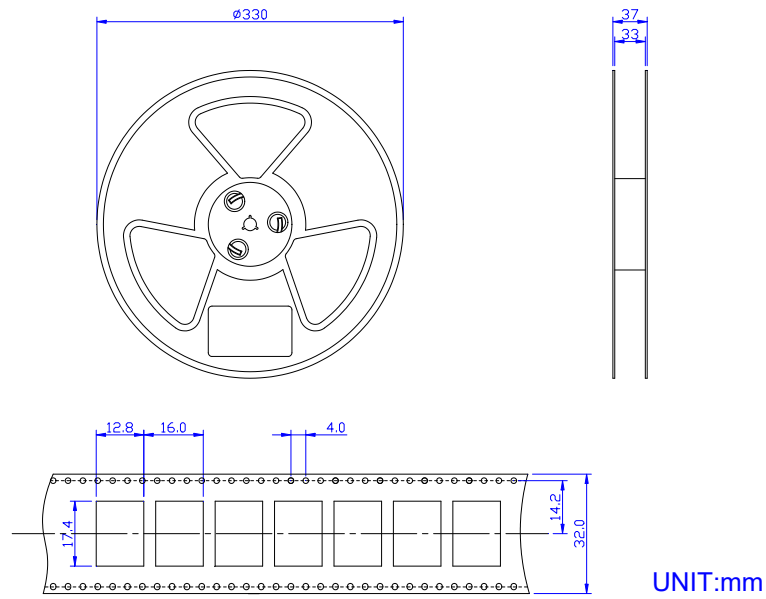


图 12-1 SKG1223 包装图/ Figure 12-1 Packing diagram of the SKG1223

13 贴片建议/ Patch Advice

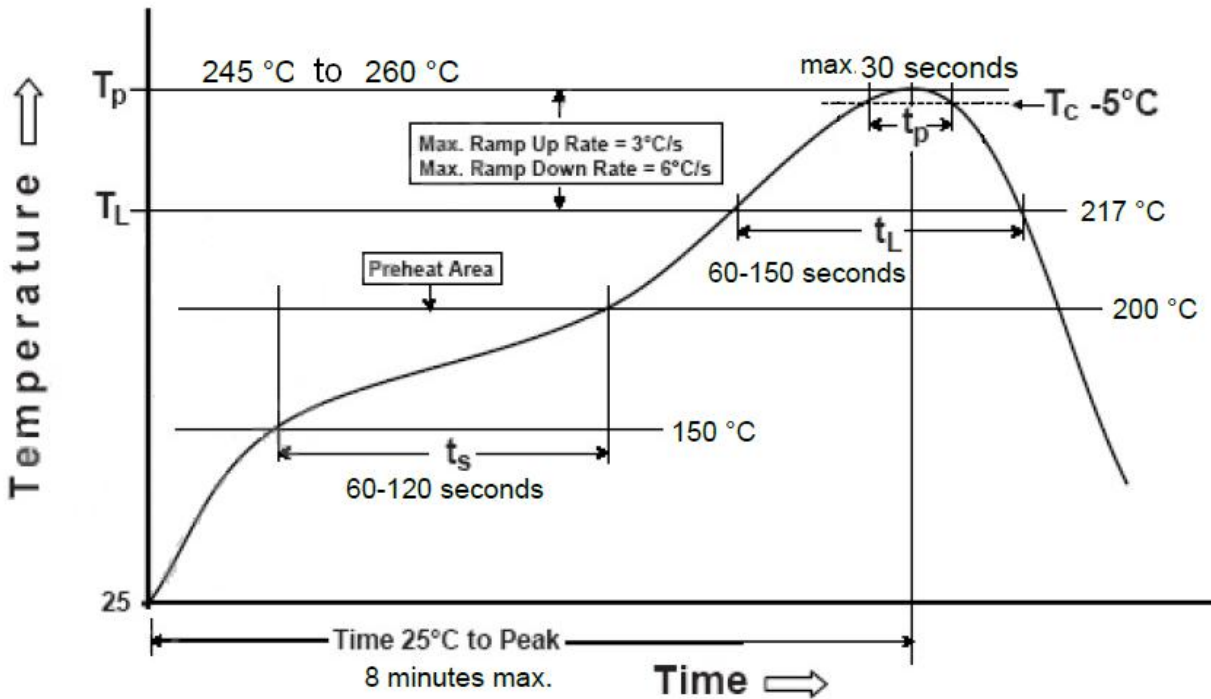
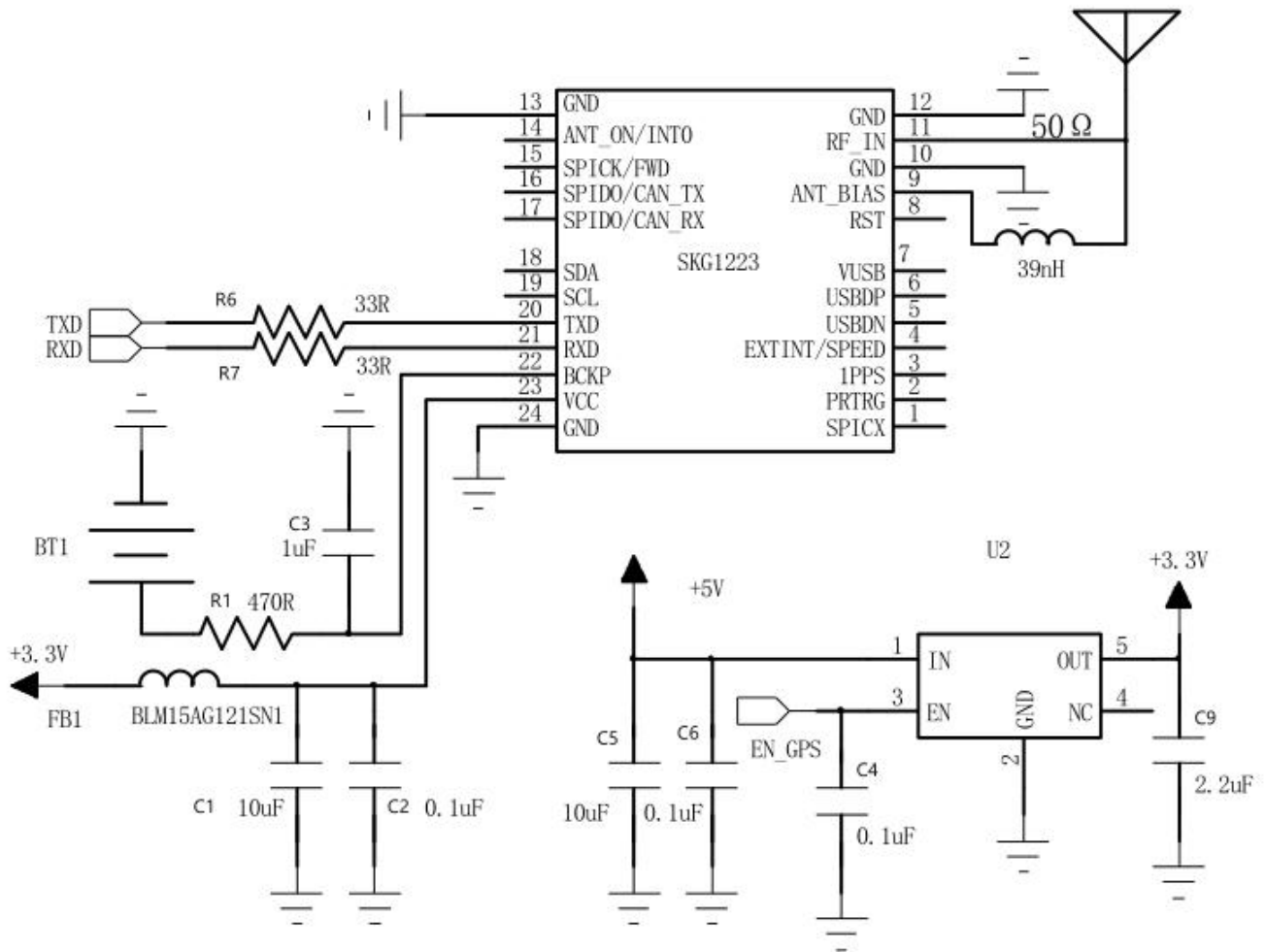


图 13-1 SKG1223 推荐炉温曲线/ Figure 13-1 SKG1223 recommended furnace temperature curve

Melting Temperature: 217 °C

Stencil Thickness: 150um

14 参考电路/ Reference Circuit



SKG1223 参考电路/ SKG1223 Reference Circuit

15 联系方式/ Contact Information

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