



司南导航

Product Specification / 产品规范

K802 OEM Module

K802 OEM 模块

2021-11-24

REVISION HISTORY / 修订历史

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I. INTRODUCTION / 简介

K802 is high precision vehicle-regulation-level positioning multi-system OEM Modules based on a self-developed SoC, it has small size, multi-system and multi-frequency. It tracks constellations including BDS-3, GPS, BDS-2, GLONASS, Galileo, SBAS and QZSS. Also with onboard inertial navigation device, supporting integrated navigation algorithm. The K802 GNSS module is mainly designed and used for intelligent driving, UAV, intelligent robot and other fields.

K802 模块是司南导航自主研发的车规级、全系统多频点的小尺寸高精度定位模块，支持 BDS-3、GPS、BDS-2、GLONASS、Galileo、SBAS 和 QZSS 等卫星导航系统的信号跟踪，板载惯导器件，支持组合导航算法，适用于智能驾驶、无人机、智能机器人等领域。

II. SPECIFICATION OF K802 OEM MODULE / K802 OEM 模块技术规范

Following table presents the detailed specification of ComNav K802 OEM Module. Specific technical characteristics are listed with its physical interface and electrical parameters.

下表中为司南 K802 OEM 模块的详细规范。同时，还列出了该模块的各项技术性能，以及它的物理接口和电气接口参数。

Table 1. K802 Specification

K802 SPECIFICATION/ K802 规范		
Signals 信号	Positioning 定位	GPS: L1C/A, L2P, L2C
		BDS-2: B1I, B2I
		BDS-3: B1C, B2b
		GLONASS: G1, G2
		Galileo: E1, E5b
		QZSS: L1C/A, L2C
		SBAS: L1C/A
		IRNSS: L5*
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)

K802 SPECIFICATION/ K802 规范		
	Hot Start (with RTC) 热启动 (使用 RTC)	< 10s (Typical, 典型)
Reacquisition 信号重捕	Reacquisition 失锁重捕	< 1s
	Signal Capture Sensitivity 信号捕获灵敏度	-138dBm
Measurement Precision 测量准确度	Pseudorange Precision 伪距精度	$\leq 10\text{cm}$
	Carrier Phase Precision 载波相位精度	$\leq 1\text{mm}$
Accuracy 精度	Time Accuracy 授时精度	20ns
	SPP Accuracy 标准单点定位精度	$H \leq 1.5\text{m}, V \leq 3\text{m} (1\sigma, \text{PDOP} \leq 4)$
	Static Differential Accuracy (Supported by Compass Solution) 静态差分精度 (Compass Solution 软件支持)	$H: \pm(2.5+1 \times 10^{-6} \times D) \text{ mm}$ $V: \pm(5.0+1 \times 10^{-6} \times D) \text{ mm}$ D 为基线长度(单位: km) D - Baseline length (Unit: km)
	Speed Accuracy 测速精度	$\leq 0.02\text{m/s}$ (RTK 固定解)
Inertial Navigation 惯导	While the GNSS antenna signal is losing lock for 3 seconds, the accuracy maintains at centimeter level. While the GNSS antenna signal is losing lock for 10 seconds, the accuracy maintains at meter level. GNSS 天线信号失锁 3s, 精度保持 cm 级	

K802 SPECIFICATION/ K802 规范

	GNSS 天线信号失锁 10s, 精度保持 m 级	
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: $\pm (8 + 10^{-6} \times D)$ mm V: $\pm (15 + 10^{-6} \times D)$ mm D 为基线长度(单位: km) D - Baseline length (Unit: km)
Data Rates 数据速率	Measurements & Position 测量&定位	100Hz (Optional, 选配项)
	RTK: Positioning RTK: 定位	100Hz (Optional, 选配项)
Electrical 电气特性	Voltage 供电电压	+ 3.3 V \pm 5 % DC
	Power Consumption 功耗	0.6 W (Anti-interference off, 未开启抗干扰) 抗干扰功能开启, 功耗约增加 0.2W Set anti-interference on consumes more about 0.2W
Environmental 环境要求	Operating Temperature 工作温度	-40°C — +85°C
	Storage Temperature 储存温度	-55°C — +95°C
Data Formats 输出数据格式	NMEA-0183	GPGLL, GPGSV, GPGLL, GPGSA, GPGST, GPHDT, GPRMC, GPVTG, GPZDA etc.

K802 SPECIFICATION/ K802 规范		
	ComNav Binary (CNB) 司南二进制格式	ComNav Self-Defined Binary 司南自定义二进制
	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 \pm 5%VDC @ 0-100mA
	LNA Gain 天线增益要求	20 ~ 35dB (Suggested 建议)
Hardware Interface 硬件接口		LGA (54PIN)
Physical 物理参数	Size 尺寸	17mm \times 22mm \times 2.8mm
	Weight 重量	5.0 grams (克)

III. DIMENSION / 尺寸

In this section, product photo, three-side views and the dimension of K802 are provided for customers' further hardware design and installation.

本节提供了 K802 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. Product Photo

图 1. 模块 1:1 实物图

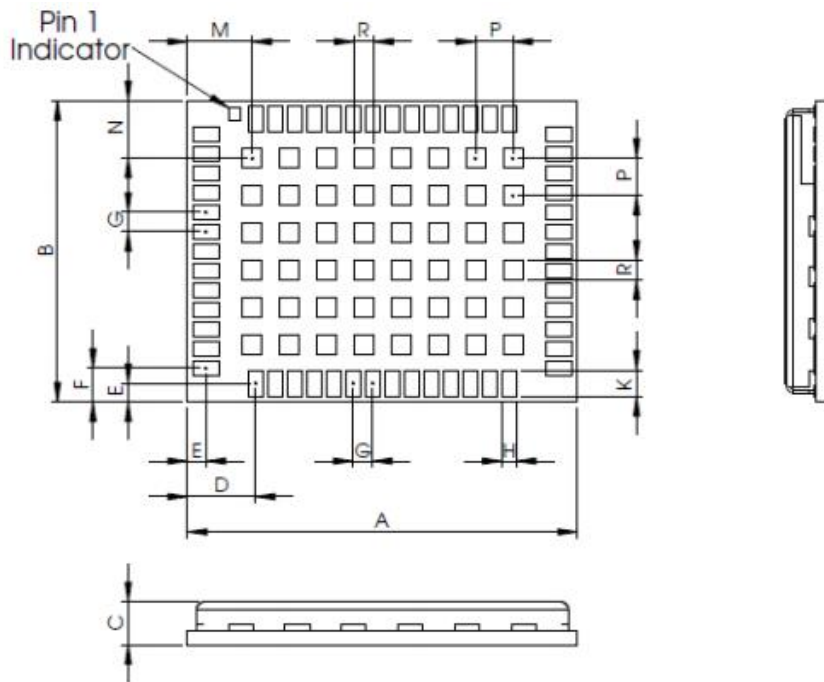


Figure 2. Dimension View

图 2. 三视图

符号	最小值(mm)	标准值(mm)	最大值(mm)
A	21.80	22.00	22.35
B	16.80	17.00	17.20
C	2.80	2.70	2.90

D	3.65	3.85	4.05
E	0.85	1.05	1.25
F	1.70	1.90	2.10
G	1.10	1.05	1.15
H	0.70	0.80	0.96
K	1.20	1.50	.180
M	3.45	3.65	3.85
N	3.05	3.25	3.45
P	2.05	2.10	2.15
R	0.88	1.10	1.32

TIPS 提示:

The copy of AutoCAD dwg files can be obtained from the attachment of this document, which can be imported into EDA tools directly to facilitate your system hardware design.

该文档的附件包含上面的 AutoCAD dwg 文件，可直接导入 EDA 软件用于系统硬件设计。

IV. PIN ARRANGEMENT AND DEFINITION OF K802 OEM MODULE/ K802 OEM 模块引脚标识和定义

K802 is surface-mount OEM Module which integrates 54 pins.

K802 包括 54pin,表贴式模块。

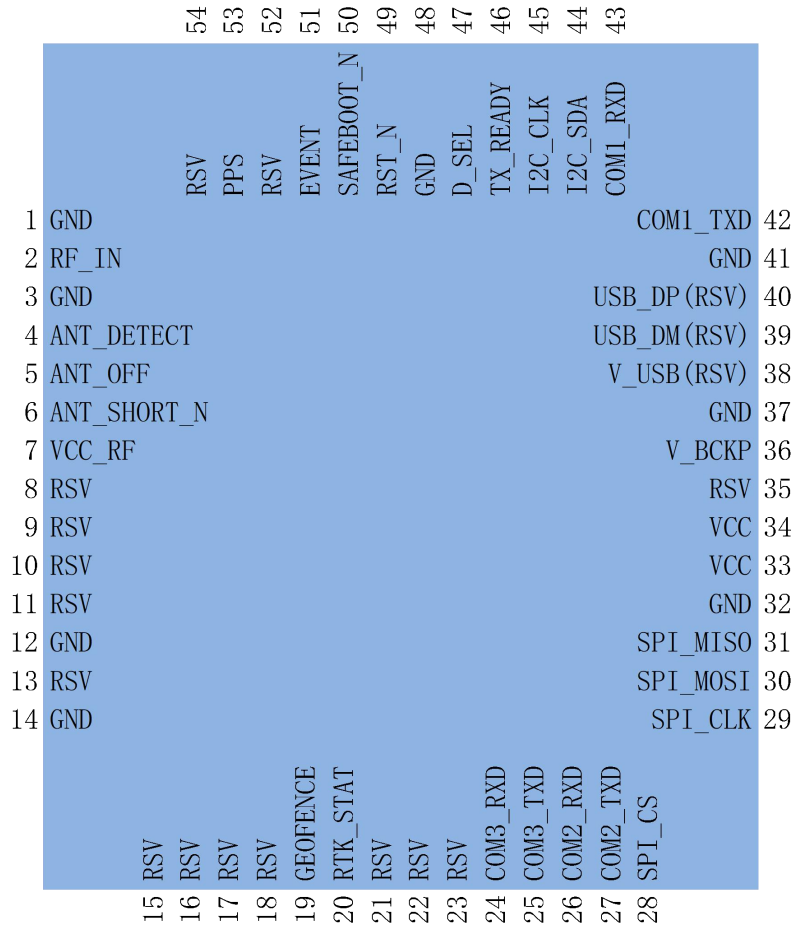


Figure 3. Pin drawing of K802 Module(Front view)

图 3. K802 模块引脚(正视图)

Table 2. Pin Definition of K802

PIN	SIGNAL	TYPE	DESCRIPTION	
1	GND	GND	Ground Reference	参考地
2	RF_IN	I	RF input	天线射频输入
3	GND	GND	Ground Reference	参考地
4	ANT_DETECT	I	Active antenna detect - default active high	天线开路检测-默认高电平
5	ANT_OFF	O	External LNA disable - default active high	外部低噪放使能-默认高电平

PIN	SIGNAL	TYPE	DESCRIPTION	
6	ANT_SHORT_N	I	Active antenna short detect - default active low	天线短路检测-默认高电平
7	VCC_RF	O	Voltage for external LNA	外部低噪放供电
8	RSV	-	Reserved	保留管脚
9	RSV	-	Reserved	保留管脚
10	RSV	-	Reserved	保留管脚
11	RSV	-	Reserved	保留管脚
12	GND	GND	Ground Reference	参考地
13	RSV	-	Reserved	保留管脚
14	GND	GND	Ground Reference	参考地
15	RSV	-	Reserved	保留管脚
16	RSV	-	Reserved	保留管脚
17	RSV	-	Reserved	保留管脚
18	RSV	-	Reserved	保留管脚
19	GEOFENCE_STAT	O	Geofence status, user defined	地理围栏-用户定义
20	RTK_STAT	O	Blinking (receiving RTCM data and processing RTK)	闪烁（接收 RTCM 数据并进行 RTK 解算时）
21	RSV	-	Reserved	保留管脚
22	RSV	-	Reserved	保留管脚
23	RSV	-	Reserved	保留管脚
24	COM3_RXD	I	UART3 input	串口 3 输入
25	COM3_TXD	O	UART3 output	串口 3 输出
26	COM2_RXD	I	UART2 input	串口 2 输入
27	COM2_TXD	O	UART2 output	串口 2 输出
28	SPI_CS	I/O	SPI_CS	SPI_CS
29	SPI_CLK	I/O	SPI_CLK	SPI_CLK

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PIN	SIGNAL	TYPE	DESCRIPTION	
30	SPI_MOSI	I	SPI_MOSI	SPI_MOSI
31	SPI_MISO	O	SPI_MISO	SPI_MISO
32	GND	GND	Ground Reference	参考地
33	VCC	PWR	Voltage supply	电源输入
34	VCC	PWR	Voltage supply	电源输入
35	RSV	-	Reserved	保留管脚
36	V_BCKP	PWR	Backup supply voltage	备用电源输入
37	GND	GND	Ground Reference	参考地
38	V_USB(RSV)	PWR	USB supply	USB 供电
39	USB_DM(RSV)	I/O	USB data	USB 数据
40	USB_DP(RSV)	I/O	USB data	USB 数据
41	GND	GND	Ground Reference	参考地
42	COM1_TXD	O	UART1 output	串口 1 输出
43	COM1_RXD	I	UART1 input	串口 2 输入
44	I2C_SDA	I/O	I2C Data	I2C 数据
45	I2C_CLK	I/O	I2C Clock	I2C 时钟
46	TX_READY	O	TX Buffer full and ready for output	数据缓冲区满，可以输出
47	D_SEL	I	Interface select for pins 42-45	42-45 针脚输出选择
48	GND	GND	Ground Reference	参考地
49	RST_N	I	RESET_N	复位
50	SAFEBOOT_N	I	SAFEBOOT_N (reserved, OPEN)	引导启动，保留常开
51	EVENT	I	External Interrupt Pin	外部中断输入
52	RSV	-	Reserved	保留管脚
53	PPS	O	Pulse Per Second	秒脉冲
54	RSV	-	Reserved	保留管脚

REMARKS / 说明:**1. Electrical characteristics / 电气特性**

COM1 / 2 (TX&RX), SPI, ANT(OPEN&SHORT), FRESET_N, ERR_STAT, RTK_STAT, are LVCMOS 3.3V. All these signals are compatible with LVCMOS / LVTTL 3.3V.

COM1 / 2 (TX&RX), SPI, ANT(OPEN&SHORT), RTK_STAT, 为LVCMOS 3.3V电平, 所有这些信号均兼容LVCMOS / LVTTL 3.3V。

LVCMOS 3.3V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	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	

LVTTL 3.3V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	——
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 灌电流	8mA	

2. Signals whose absolute maximum rating is -0.3V ~ 3.6V are as follows:

所能承受电压的最大值范围是-0.3V ~ 3.6V的信号如下:

COM1 / 2 (TX&RX), SPI, ANT(OPEN&SHORT), RTK_STAT, PGMEN, RST_N, PPS, EVENT

3. VCC is main power supply, and voltage range is 3.3V. The requirement for voltage ripple and spike is less than 50mV. VCC_RF antenna feed, and voltage range is 3.3V to 5.5V. The requirements for voltage ripple and spike are less than 50mV. The voltage range of V_BACKUP is 1.8V to 3.6V, and the requirements for voltage ripple and spike are less than 30mV.

VCC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。VCC_RF天线馈电，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_BCKP，电压1.8V~3.6V，电压纹波和尖峰脉冲要求小于30mV。

4. RTK_STAT

RTK_STAT is a positioning indicator, it works at high electrical level. When RTK solution is fixed, the indicators output high electrical level. Otherwise, it output low electrical level. Additional LED indicator light is required.

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。

5. Add surge protection /增加浪涌保护

When the user integrates the module, an external high-gain choke antenna is connected. If a surge protector is not added, it is easy to damage the current-feeding current-limiting chip inside the module. It is recommended that users install a surge protector on the antenna when connecting a high-gain choke antenna.

当用户集成模块时，外接高增益的扼流圈天线，如果不加浪涌保护器，容易造成模块内部的馈电限流芯片损坏。建议用户在外接高增益扼流圈天线时，天线上安装一个浪涌保护器。

V. ASSEMBLING & REPAIRING NOTE/ 装配及维修说明

1. ASSEMBLING NOTE/装配说明

K802 is surface mounted, SMT welding is recommended for assembly.

K802为表贴式模块，推荐使用SMT的焊接方式进行装配。

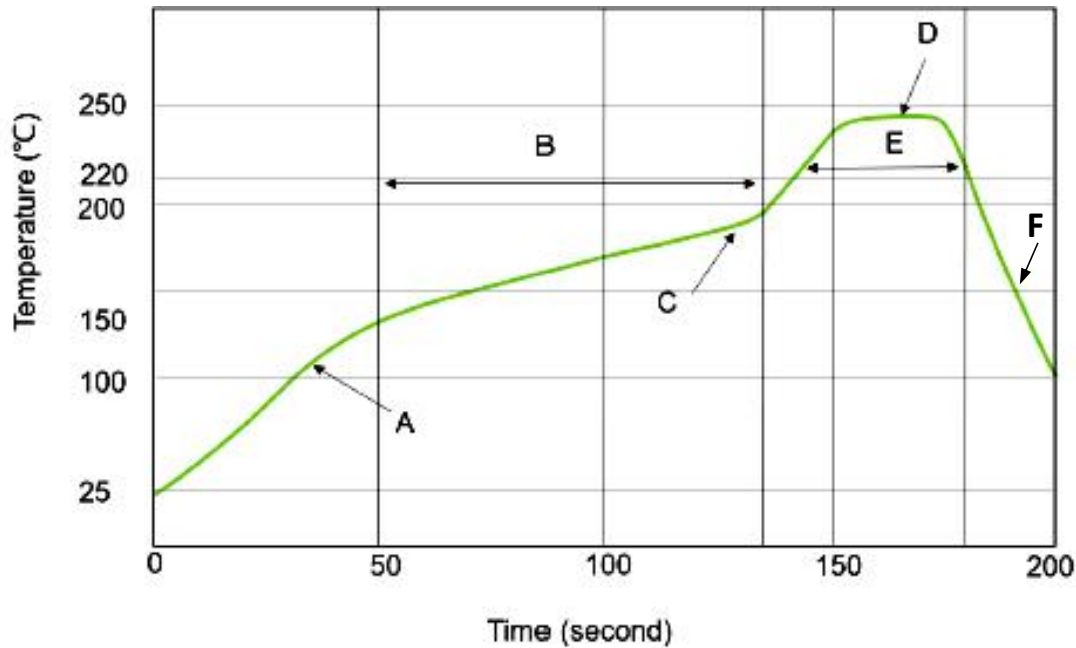


Figure 4. Furnace temperature curve

图 4.炉温曲线

The process temperature limits are as follows:

- A: Heating Zone: Rising Slope: 1~3 °C/sec
- B: Constant Temperature Zone: Range: 150-190 °C Time: 80-110 S
- C: Constant Temperature→Reflow Zone: Rising Slope: 1~3 °C/sec
- D: Peak Temperature: 235-245°C
- E: Reflow Zone: Range: Over 220°C Time: 50-80 S
- F: Descent Slope: -5°C~-1°C/sec

制程温度界限如下：

- A: 升温区：斜率：1~3 °C/sec
- B: 恒温区：150-190 °C 时间：80-110 S
- C: 恒温→回流区：斜率：1~3 °C/sec

D: 峰值温度: 235-245 °C

E: 回流区: 大于 220 °C 时间: 50-80 S

F: 下降斜率 : -5~-1 °C/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。

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。

VI. APPLICATION CONNECTION EXAMPLE / 应用连接示例

In this section, an application connection example of K802 OEM Module is presented via specific schematic diagrams. Per the instruction of these diagrams, you could easily build the communication circuits between K802 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 K802 模块应用连接示例。参照下面的图示，您可以很方便建立 K802 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。

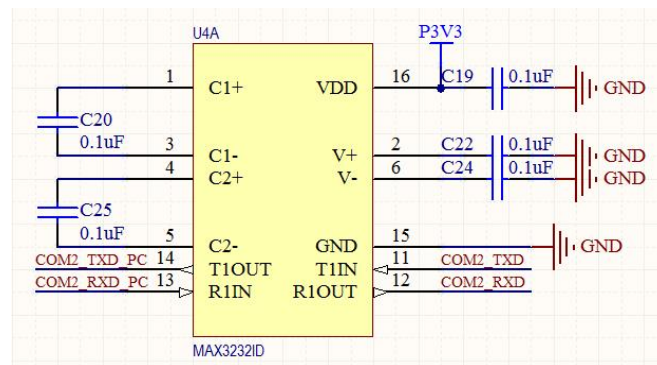


Figure 5. Connections between RS232 COM1, 2 of K802 and Some Other Devices with an UART

图 5. K802 RS232 COM1、2 与其他使用 UART 接口的设备之间的连接示意