



# 司南导航

Product Specification / 产品规范

## K803 and K823 OEM Module

## K803, K823 OEM 模块

2020-05-11

## REVISION HISTORY / 修订历史

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## I. INTRODUCTION / 简介

K803、K823 are high precision positioning multi-system OEM Modules based on a self-developed SoC, it has small size, multi-system and multi-frequency. They track constellations including GPS, BDS-2, BDS-3, GLONASS, Galileo, SBAS and QZSS, are mainly designed and used for UAV and handheld devices with size, weight, and power requirements.

K803、K823 模块是司南导航自主研发的多系统、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。

## II. SPECIFICATION OF K803&K823 OEM MODULE / K803&K823 OEM 模块技术规范

Following table presents the detailed specification of ComNav K803&K823 OEM Module. Specific technical characteristics are listed with its physical interface and electrical parameters.

下表中为司南 K803&K823 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. K803&amp;K823 Specification

K803&K823 SPECIFICATION/ K803&K823 规范			
Signals 信号	K803	Positioning 定位	GPS: L1, L1C, L2C, L2P, L5
			BDS-2: B1I, B2I, B3I
			BDS-3: B1I, B3I, B1C, B2a, B2b*
			GLONASS: G1, G2, G3*
			Galileo: E1, E5a, E5b, E6C, AltBOC*
			QZSS: L1, L2C, L5*
			SBAS: L1*
			IRNSS: L5*
			L-band*
	K823	Positioning 定位	GPS: L1, L2
			BDS-2: B1I, B3I
			BDS-3: B1I, B3I, B1C, B2b*
			GLONASS: G1, G2
			Galileo: E1, E5b
			QZSS: L1, L2*
			SBAS: L1*
		Orientation 定向	GPS: L1, L2
			BDS-2: B1I, B3I
			BDS-3: B1I, B3I
			GLONASS: G1, G2
			Galileo: E1, E5b
			QZSS: L1, L2*
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	< 60s （Typical,典型） < 40s （Adding Acceleration Capture Module,增加捕	

K803&K823 SPECIFICATION/ K803&K823 规范		
		获加速模块)
	Hot Start (with RTC) 热启动 (使用 RTC)	< 15s (Typical, 典型)
Reacquisition 信号重捕	失锁重捕	< 2s
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	$\leq 0.005c$ (c: carrier wave length of GNSS signal, in meter) (c: 载波波长, 单位: 米)
Accuracy 精度	Time Accuracy 授时精度	20ns
	SPP Accuracy 标准单点定位精度	$H \leq 1.5\text{m}, V \leq 3\text{m}$ ( $1\sigma$ , 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 为基线距离(单位: km) D - Baseline length (Unit: km)
Inertial Navigation 惯导	<p>While the GNSS antenna signal is losing lock for 3 seconds, the accuracy maintains at centimeter level.</p> <p>While the GNSS antenna signal is losing lock for 10 seconds, the accuracy maintains at meter level.</p> <p>GNSS 天线信号失锁 3s, 精度保持 cm 级</p> <p>GNSS 天线信号失锁 10s, 精度保持 m 级</p>	

K803&K823 SPECIFICATION/ K803&K823 规范		
Attitude Accuracy 测姿精度 (K823)	Azimuth Accuracy (dual-Module) 方位角精度	(0.2/R) °, R is baseline length in meter. R 为基线距离, 单位为米
	Roll or Pitch Accuracy (dual-Module) 横滚或俯仰角	(0.4/R) °, R is baseline length in meter. R 为基线距离, 单位为米
RTK	RTK Initialization time RTK 初始化时间	< 10s (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: $\pm (20 + 10^{-6} \times D)$ 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	Max 50Hz (Optional, 选配项)
	RTK: Positioning & Heading RTK: 定位定向 (定向仅 K823 支持) (Only K823 support heading)	Max 20Hz (Optional, 选配项)
Electrical 电气特性	Voltage 供电电压	+ 3.3 V $\pm$ 5 % DC
	Power Consumption 功耗	K803:1.0 W (Anti-interference off, 未开启抗干扰) K823:1.6 W (Anti-interference off, 未开启抗干扰)
Environmental 环境要求	Operating Temperature 工作温度	-40°C — +85°C
	Storage Temperature	-55°C — +95°C

K803&K823 SPECIFICATION/ K803&K823 规范		
	储存温度	
<b>Data Formats</b> 输出数据格式	NMEA-0183	GPGLL, GPGSV, GPGGA, GPRMC, GPVTG, GPZDA etc.
	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
<b>Antenna Interface</b> 天线接口	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 天线增益要求	20 ~ 40dB (suggested 建议)
<b>Hardware Interface</b> 硬件接口		K803: 表贴 LGA (82PIN) K823: 表贴 LGA (60PIN)
<b>Physical</b> 物理参数	Size 尺寸	K803: 30mm×30mm×3.2mm
		K823: 30mm×40mm×3.2mm
	Weight 重量	K803: 8.0 grams (克) K823: 10.0 grams (克)



### III. DIMENSION / 尺寸

In this section, product photo, three-side views and the dimension of K803 / K823 are provided for customers' further hardware design and installation.

本节提供了 K803、K823 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 (left K803 / right K823)

图 1. 模块 1:1 实物图（左 K803，右 K823）

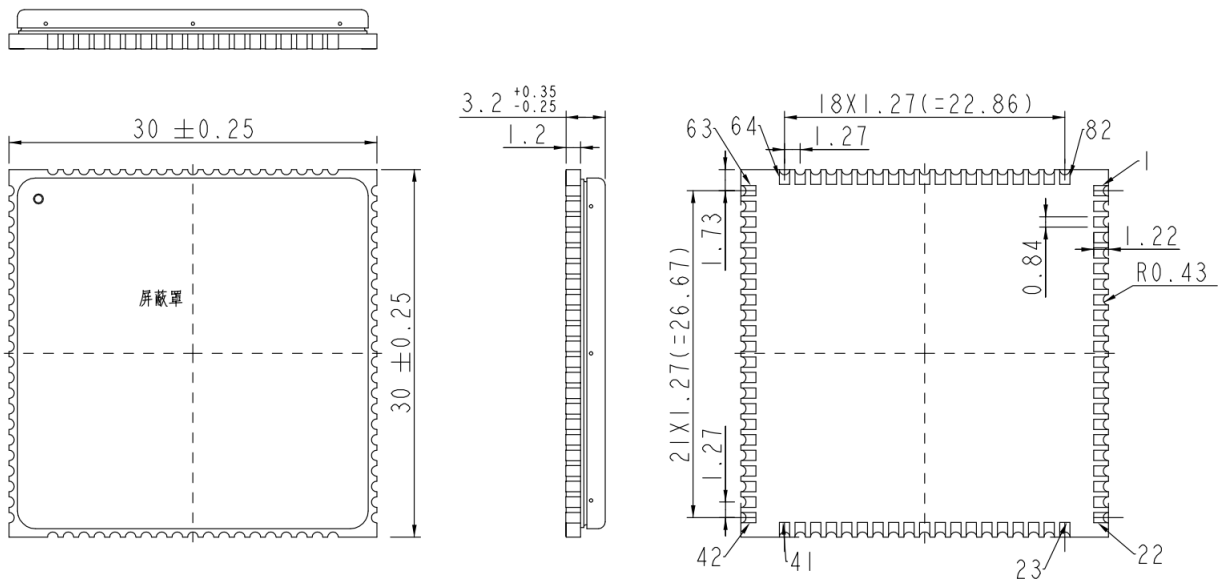


Figure 2. K803 Dimension View

图 2. K803 三视图

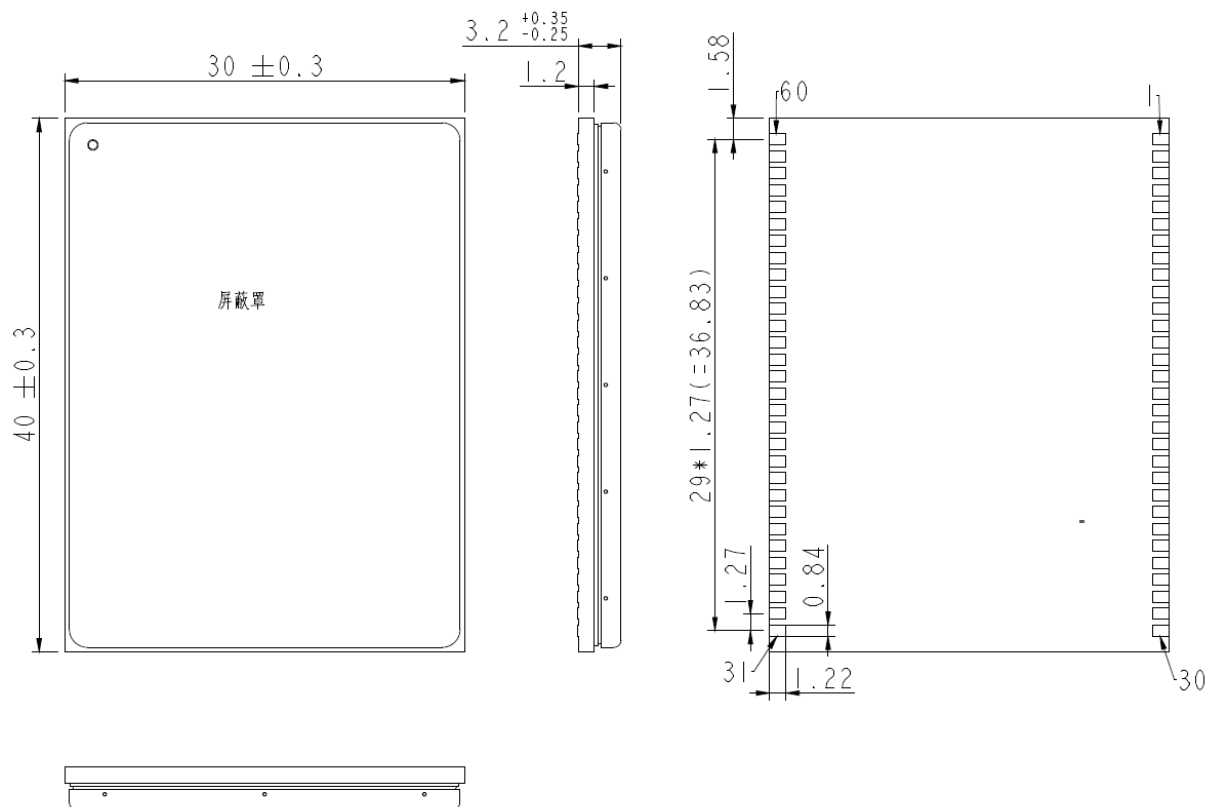


Figure 3. K823 Dimension View

图 3. K823 三视图

**TIPS 提示:**

The copy of AutoCAD dwg files as shown in figure 2 and figure 3 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 K803 OEM MODULE/ K803 OEM 模块引脚标识和定义

K803 is surface-mount OEM Module which integrates 82 pins (pitch 1.27mm, twin-row).

K803 包括 82pin,表贴式模块（pitch 1.27mm，双排）。

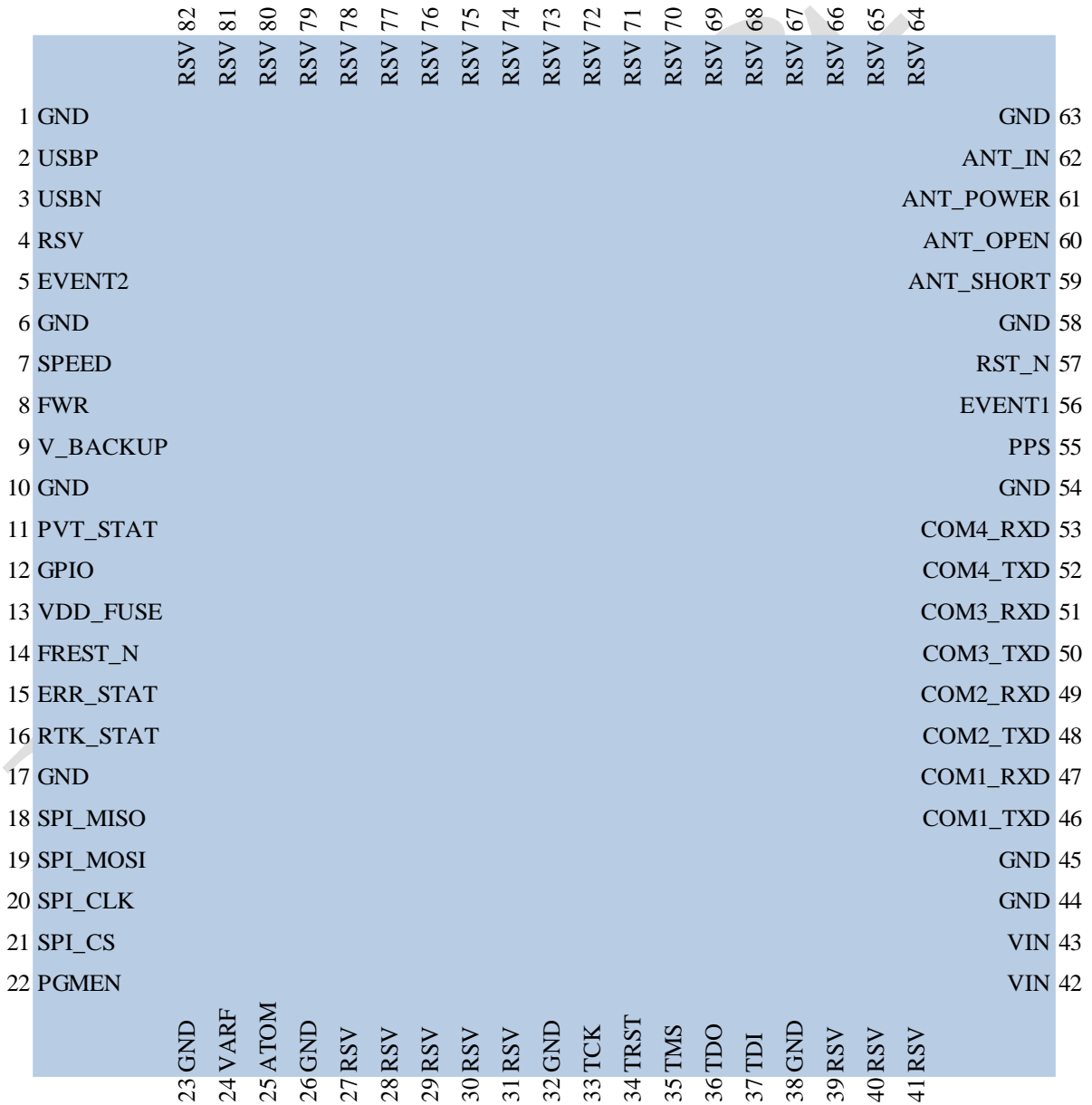


Figure 4. Pin drawing of K803 Module (Front view)

图 4. K803 模块引脚(正视图)

Table 2. Pin Definition of K803

PIN	SIGNAL	TYPE	DESCRIPTION	
1	GND	PWR	Ground Reference	参考地
2	USB_PP	I/O	USB interface data (+) (Reserved)	USB 数据信号(+)(保留)
3	USB_PN	I/O	USB interface data (-) (Reserved)	USB 数据信号(-)(保留)
4	RSV		Reserve	保留管脚（悬空）
5	EVENT2	I	Event mark	外部事件输入
6	GND	PWR	Ground Reference	参考地
7	SPEED	I	Speedometer (Reserved)	里程计—脉冲（保留）
8	FWR	I	speedometerouk (Reserved)	里程计—方向（保留）
9	V_BACKUP	PWR	Power supply for internal RTC	外接 RTC 电池
10	GND	PWR	Ground Reference	参考地
11	PVT_STAT	O		PVT 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。
12	GPIO	I/O	General-purpose input/output	通用 IO
13	VDD_FUSE	PWR	Power supply for internal FUSE (float)	FUSE 烧录电源输入（悬空）
14	FRESET_N	I	Reset to factory mode, active low	复位为出厂模式，低电平有效
15	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。
16	RTK_STAT	O	RTK data LED indicator	RTK 数据指示灯，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。
17	GND	PWR	Ground Reference	参考地
18	SPI_MISO	I	SPI_MISO	SPI 主输入从输出信号
19	SPI_MOSI	O	SPI_MOSI	SPI 主输出从输入信号

PIN	SIGNAL	TYPE	DESCRIPTION	
20	SPI_CLK	O	SPI_CLK	SPI 总线时钟信号
21	SPI_CS	O	SPI_CS	SPI 总线片选信号
22	PGMEN	I	Program enable	烧录使能（悬空）
23	GND	PWR	Ground Reference	参考地
24	VARF	O		方波输出
25	ATOM	I		原子钟输入
26	GND	PWR	Ground Reference	参考地
27~ 31	RSV		Reserve	保留管脚（悬空）
32	GND	PWR	Ground Reference	参考地
33	TCK	I	JTAG TCK（float）	JTAG TCK（悬空）
34	TRST	I	JTAG TRST（float）	JTAGTRST（悬空）
35	TMS	I	JTAG TMS（float）	JTAG TMS（悬空）
36	TDO	O	JTAG TDO（float）	JTAG TDO（悬空）
37	TDI	I	JTAG TDI（float）	JTAG TDI（悬空）
38	GND	PWR	Ground Reference	参考地
39~ 41	RSV		reserve	保留管脚（悬空）
42	VIN	PWR	DC power supply for card (3.3V)	模块供电电源(+3.3V)
43	VIN	PWR	DC power supply for card (3.3V)	模块供电电源(+3.3V)
44	GND	PWR	Ground Reference	参考地
45	GND	PWR	Ground Reference	参考地
46	COM1_TXD	O	Transmitted Data for COM 1 output	串口 1 输出信号
47	COM1_RXD	I	Received Data for COM 1 input	串口 1 输入信号
48	COM2_TXD	O	Transmitted Data for COM 2 output	串口 2 输出信号
49	COM2_RXD	I	Received Data for COM 2 input	串口 2 输入信号
50	COM3_TXD	O	Transmitted Data for COM 3 output	串口 3 输出信号

PIN	SIGNAL	TYPE	DESCRIPTION	
51	COM3_RXD	I	Received Data for COM 3 input	串口 3 输入信号
52	COM4_TXD	O	Transmitted Data for COM 4 output	串口 4 输出信号
53	COM4_RXD	I	Received Data for COM 4 input	串口 4 输入信号
54	GND	PWR	Ground Reference	参考地
55	PPS	O	Pulse output synchronized to OEM Time	同步卫星时间脉冲
56	EVENT1	I	Event mark	外部事件输入
57	RST_N	I	Quick reset without clearing user configuration	快速复位, 不清除用户配置 (低电平有效)
58	GND	PWR	Ground Reference	参考地
59	ANT_SHORT	O	Short indication of antenna	天线短路指示(低有效)
60	ANT_OPEN	O	Open indication of antenna	天线断路指示(低有效)
61	ANT_PWR	PWR	Power supply for external GNSS antenna LNA	外部 GNSS 天线供电
62	ANT_IN	I	GNSS antenna	GNSS 天线输入
63	GND	PWR	Ground Reference	参考地
64~82	RSV		Reserve	保留管脚 (悬空)

## V. PIN ARRANGEMENT AND DEFINITION OF K823 OEM MODULE/ K823 OEM 模块引脚标识和定义

K823 is surface-mount OEM module which integrates 60 pins (pitch 1.27mm, twin-row).

K823 包括 60pin,表贴式模块（pitch 1.27mm，双排）。

1 GND	GND 60
2 ANT1_IN	ANT2_IN 59
3 GND	GND 58
4 GND	GND 57
5 ANT1_PWR	ANT2_PWR 56
6 GND	GND 55
7 ANT1_OPEN	ANT2_OPEN 54
8 ANT1_SHORT	ANT2_SHORT 53
9 GND	GND 52
10 USBP	TMS 51
11 USBN	TDO 50
12 NTRST	TDI 49
13 EVENT2	TCK 48
14 GND	GND 47
15 SPEED	RST_N 46
16 FWR	EVENT1 45
17 V_BACKUP	PPS 44
18 GND	GND 43
19 GPIO1	RSV 42
20 GPIO2	RSV 41
21 VDD_FUSE	COM3_RXD 40
22 FREST_N	COM3_TXD 39
23 ERR_STAT	COM2_RXD 38
24 RTK_STAT	COM2_TXD 37
25 GND	COM1_RXD 36
26 SPI_MISO	COM1_TXD 35
27 SPI_MOSI	GND 34
28 SPI_CLK	GND 33
29 SPI_CS	VIN 32
30 PGMEN	VIN 31

Figure 5. Pin drawing of K823 Module (Front view)

图 5. K823 模块引脚(正视图)

Table 3. Pin Definition of K823

PIN	SIGNAL	TYPE	DESCRIPTION	
1	GND	PWR	Ground Reference	参考地
2	ANT1_IN	I	GNSS Positioning antenna	GNSS 定位天线
3	GND	PWR	Ground Reference	参考地
4	GND	PWR	Ground Reference	参考地
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	PWR	Ground Reference	参考地
10	USB_PP	I/O	USB interface data (+) (Reserved)	USB 数据信号(+)(保留)
11	USB_PN	I/O	USB interface data (-) (Reserved)	USB 数据信号(-)(保留)
12	NTRST	I	JTAG NTRST (float)	JTAG NTRST(悬空)
13	EVENT2	I	Event mark	外部事件输入
14	GND	PWR	Ground Reference	参考地
15	SPEED	I	Speedometer (Reserved)	里程计—脉冲 (保留)
16	FWR	I	Speedometerkou (Reserved)	里程计—方向 (保留)
17	V_BACKUP	PWR	Power supply for internal RTC	外接 RTC 电池
18	GND	PWR	Ground Reference	参考地
19	GPIO1	I/O	General-purpose input/output	通用 IO1
20	GPIO2	I/O	General-purpose input/output	通用 IO2
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

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PIN	SIGNAL	TYPE	DESCRIPTION	
				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，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。
25	GND	PWR	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	烧录使能（悬空）
31	VIN	PWR	DC power supply for card (3.3V)	模块供电电源(+3.3V)
32	VIN	PWR	DC power supply for card (3.3V)	模块供电电源(+3.3V)
33	GND	PWR	Ground Reference	参考地
34	GND	PWR	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	RSV		Reserve	保留管脚
42	RSV		Reserve	保留管脚
43	GND	PWR	Ground Reference	参考地
44	PPS	O	Pulse output synchronized to OEM Time	同步卫星时间脉冲

PIN	SIGNAL	TYPE	DESCRIPTION	
45	EVENT1	I	Event mark	外部事件输入
46	RST_N	I	Quick reset without clearing user configuration	快速复位, 不清除用户配置 (低电平有效)
47	GND	PWR	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	PWR	Ground Reference	参考地
53	ANT2_SHORT	O	Short indication of Orientation antenna	定向天线短路指示(低有效)
54	ANT2_OPEN	O	Open indication of Orientation antenna	定向天线断路指示(低有效)
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	GND	PWR	Ground Reference	参考地
58	GND	PWR	Ground Reference	参考地
59	ANT2_IN	I	GNSS Orientation antenna	GNSS 定向天线
60	GND	PWR	Ground Reference	参考地

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

COM1 / 2 / 3(TX&RX), SPI, ANT1 / 2(OPEN&SHORT), JTAG, SPEED, FWR, GPIO1 / 2, FRESET\_N, ERR\_STAT, RTK\_STAT, PGMEN, RST\_N, PPS, EVENT and EVENT2 are LVCMOS 3.3V. All these signals are compatible with LVCMOS / LVTTL 3.3V.

COM1 / 2 / 3(TX&RX), SPI, ANT1 / 2(OPEN&SHORT), JTAG, SPEED, FWR, GPIO1 / 2, 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。

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## LVCMOS 3.3V电气标准

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

## LVTTTL 3.3V电气标准

Symbols/符号	Description/描述	Min/最小	Max/最大
V <sub>IH</sub>	Input high voltage 输入高电压	2.0V	---
V <sub>IL</sub>	Input low voltage 输入低电压	-0.3V	0.8V
V <sub>OH</sub>	High-level output voltage 高电平输出电压	2.4V	----
V <sub>OL</sub>	Low-level output voltage 低电平输出电压	---	0.4V
I <sub>OH</sub>	Sourcing current 拉电流	8mA	
I <sub>OL</sub>	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 / 3(TX&RX), SPI, ANT1 / 2(OPEN&SHORT), JTAG, SPEED, FWR, GPIO1 / 2, FRESET\_N, ERR\_STAT, RTK\_STAT, PGMEN, RST\_N, PPS, EVENT and EVENT2

3. VIN is main power supply, and voltage range is 3.3V. The requirement for voltage ripple and spike is less than 100mV. K823: ANT1\_PWR / ANT2\_PWR, K803: ANT\_PWR 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.

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。K823: ANT1\_PWR / ANT2\_PWR, K803: ANT\_PWR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\_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 is an abnormal indicator. It works at high electrical level, when the module system self-check is out of date, it output high electrical level. Otherwise, it output low electrical level. 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. PVT\_STAT is a positioning indicator for K803 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K803 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。

## VI. APPLICATION CONNECTION EXAMPLE / 应用连接示例

In this section, an application connection example of K803 / K823 OEM Module is presented via specific schematic diagrams. Per the instruction of these diagrams, you could easily build the communication circuits between K803 / K823 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 K803, K823 模块应用连接示例。参照下面的图示，您可以很方便建立 K803, K823 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。

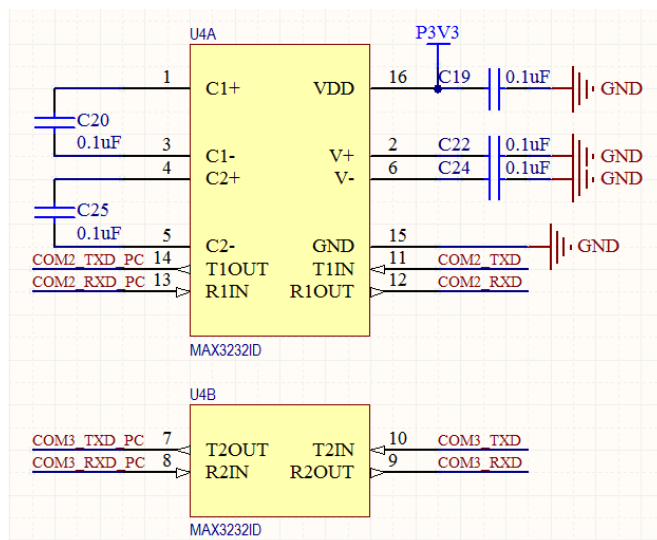


Figure 6. Connections between RS232 COM1, 2, 3 of K803 / K823 and Some Other Devices with an UART

图 6. K803, K823 RS232 COM1、2、3 与其他使用 UART 接口的设备之间的连接示意