



Product Specification/产品规范

K500, K501, K501G and K505 OEM Board

K500, K501, K501G, K505 OEM 板卡

2015-07-16

REVISION HISTORY/修订历史

REVISION/版本	MODIFICATION/更改	DATE/日期
2.2	更新图 1 中的 K500 外形尺寸图 Update the dimensional drawing of K500 board in Figure 1	2015-07-16
2.1	(1) Part of the error is corrected. /修改部分错误 (2) PPS index presentation was optimized. /完善 PPS 指标 (3) Modify the storage temperature parameter./修改存储温度参数 (4) Add SBAS satellite tracking parameter. /增加 SBAS 卫星跟踪参数	2015-01-16
2.0	(1) Information on K501, K501G and K505 are supplemented./添加 K501、K501G、K505 产品信息 (2) A new document name is used. /修改文件名	2014-09-05
1.1	(1) Add Chinese Description/增加中文翻译 (2) Attach AutoCAD dxf file of K500 Dimension/添加 K500 尺寸 dxf 源文件	2013-08-16
1.0	New Release/新发	2013-08-08

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I. SPECIFICATION OF K500, K501, K501G AND K505 OEM BOARD / K500, K501, K501G, K505 OEM 板卡技术规范

Following table presents the detailed specification of ComNav K500, K501, K501G and K505 OEM board. Specific technical characteristics are listed with their physical interfaces and electrical parameters.

下表中为司南 K500, K501, K501G 和 K505OEM 板卡的详细规范。同时，还列出了该板卡的各项技术性能，以及它的物理接口和电气接口参数。

Table 1. K500, K501, K501G and K505 Specification

K500, K501, K501G AND K505 SPECIFICATION / K500, K501, K501G 和 K505 规范			
GNSS Signals GNSS 信号	K500	GPS L1C/A	14 GPS satellite tracked at the same time 可同时跟踪 14 颗 GPS 卫星
		BDS B1I	14 BDS satellite tracked at the same time 可同时跟踪 14 颗 BDS 卫星
		GLONASS G1C ^{Note 1}	14 GLONASS Satellites Tracked at the same time 可同时跟踪 14 颗 GLONASS 卫星
		SBAS L1C/A	4 SBAS Satellites Tracked at the same time 可同时跟踪 4 颗 SBAS 卫星
	K501	GPS L1C/A, L1P, L2P	14 GPS satellite tracked at the same time 可同时跟踪 14 颗 GPS 卫星
		BDS B1I, B2I	14 BDS satellite tracked at the same time 可同时跟踪 14 颗 BDS 卫星
		SBAS L1C/A	4 SBAS Satellites Tracked at the same time 可同时跟踪 4 颗 SBAS 卫星
	K501G	GPS L1C/A, L1P, L2P	14 GPS satellite tracked at the same time 可同时跟踪 14 颗 GPS 卫星
		GLONASS G1C, G2C	14 GLONASS Satellites Tracked at the same time 可同时跟踪 14 颗 GLONASS 卫星

K500, K501, K501G AND K505 SPECIFICATION/K500, K501, K501G 和 K505 规范			
		SBAS L1C/A	4 SBAS Satellites Tracked at the same time 可同时跟踪 4 颗 SBAS 卫星
	K505	GPS L1C/A, L1P, L2P	14 GPS satellite tracked at the same time 可同时跟踪 14 颗 GPS 卫星
		BDS B1I, B2I, B3I	14 BDS satellite tracked at the same time 可同时跟踪 14 颗 BDS 卫星
		SBAS L1C/A	4 SBAS Satellites Tracked at the same time 可同时跟踪 4 颗 SBAS 卫星
Time to First Fix 首次定位时间	Cold 冷启动		<50s
	Warm 温启动		< 45s
Reacquisition 信号重捕	L1 or B1		<1.5s (fastmode) (快速) < 3s (normal mode) (普通)
Measurement Precision 测量精度	K500	Pseudorange Precision 伪距精度	GPS: L1 = 10cm BDS: B1 = 10cm GLONASS: G1=20cm
		Carrier Phase Precision 载波相位精度	GPS: L1 = 1.0mm BDS: B1 = 1.0mm GLONASS: G1=1.0mm
	K501	Pseudorange Precision 伪距精度	GPS: L1 = 10cm / L2 = 10cm BDS: B1 = 10cm / B2 = 10cm
		Carrier Phase Precision 载波相位精度	GPS: L1 = 1.0mm / L2 = 1.0mm BDS: B1 = 1.0mm / B2 = 1.0mm
	K501G	Pseudorange Precision 伪距精度	GPS: L1 = 10cm / L2 = 10cm GLONASS: G1=20cm/G2=20cm
		Carrier Phase Precision 载波相位精度	GPS: L1 = 1.0mm / L2 = 1.0mm GLONASS: G1=2.0mm/G2=2.0mm
	K505	Pseudorange Precision	GSP: L1=10cm/L2=10cm

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K500, K501, K501G AND K505 SPECIFICATION/K500, K501, K501G 和 K505 规范			
		伪距精度	BDS: B1=10cm/B2=10cm/B3=5cm
		Carrier Phase Precision	GPS: L1=1.0mm/L2=1.0mm
		载波相位精度	BDS: B1=1.0mm/B2=1.0mm/B3=1.0mm
Positioning and Time Accuracy 定位与授时精度		Time Accuracy 授时精度	20ns
		Output Delay 输出延迟	40ns
		SPP Accuracy 标准单点定位精度	Single-frequency/单频: H≤3m, V≤5m (1σ, PDOP≤4) dual-frequency/双频: H≤1.5m, V≤3m (1σ, PDOP≤4)
		Static Differential Accuracy(Supported by Compass Solution) 静态差分精度 (Compass Solution 软件支持)	H: ±(2.5 + 1×10 ⁻⁶ ×D)mm V: ±(5 + 1×10 ⁻⁶ ×D)mm
RTK/RTD Performance RTK/RTD 性能	RTD	Pseudorange Differential Accuracy 伪距差分精度	H: ±0.5m V: ±1.2m
	K500	RTK Initialization time RTK 初始化时间	< 15s (baseline<5km, 基线长小于 5km)
		Initialization Reliability 初始化置信度	> 99.9%
		Dynamic Differential Accuracy 动态差分精度	H: ±(10 + 1×10 ⁻⁶ ×D)mm V: ±(20 + 1×10 ⁻⁶ ×D)mm
	K501	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%

K500, K501, K501G AND K505 SPECIFICATION/K500, K501, K501G 和 K505 规范				
		Dynamic Differential Accuracy 动态差分精度	H: $\pm(10 + 1 \times 10^{-6} \times D)$ mm V: $\pm(20 + 1 \times 10^{-6} \times D)$ mm	
	K501G	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%	
		Dynamic Differential Accuracy 动态差分精度	H: $\pm(10 + 1 \times 10^{-6} \times D)$ mm V: $\pm(20 + 1 \times 10^{-6} \times D)$ mm	
	K505	RTK Initialization Time RTK 初始化时间	<10s (baseline<20km, 基线长小于 20km)	
		E-RTK Initialization Time E-RTK 初始化时间	1s	
		Initialization Reliability 初始化置信度	> 99.9%	
		Dynamic Differential Accuracy 动态差分精度	H: $\pm(10 + 1 \times 10^{-6} \times D)$ mm V: $\pm(20 + 1 \times 10^{-6} \times D)$ mm	
		E-RTK Differential Accuracy E-RTK 差分精度	H: $\pm(200 + 1 \times 10^{-6} \times D)$ mm V: $\pm(400 + 1 \times 10^{-6} \times D)$ mm	
	Data Rates 数据速率	Measurements & Position 测量&定位	5Hz(Max:20Hz)	
	Electrical 电气特性	Data Storage Space 数据存储空间		100MB on Board (板卡自带)
		Voltage 供电电压		+3.3V ~ +5V \pm 5%VDC
		K500	Power Consumption	1.06W
		K501	(no antenna connected)	1.35W

K500, K501, K501G AND K505 SPECIFICATION/K500, K501, K501G 和 K505 规范				
	K501G	功耗（未接天线）	1.35W	
	K505		1.45W	
Environmental 环境要求	Operating Temperature 工作温度		-40°C — +80°C	
	Storage Temperature 储存温度		-55°C — +95°C	
Data Formats 输出数据格式	NMEA-0183		GPGGA, GPGGARTK, GPGSV, GPGLL, GPGSA, GPGST, GPHDT, GPRMC, GPVTG, GPZDA etc.	
	ComNav Binary 司南二进制格式		ComNavSelf-Defined 司南自定义	
	CMR(GPS)		CMROBS, CMRREF	
	RTCM2.X		RTCM1, RTCM3,RTCM1819,RTCM59,RTCM31	
	RTCM3.0		1004,1005, 1006, 1007,1008, 1011,1012, 1104, 1033,	
	RTCM3.2 MSM4		1074, 1084, 1124	
Antenna Interface 天线接口	Antenna Connector 天线连接器		MCX female (MCX 母头), 50Ω	
	LNA Power (Internal) 天线供电电压		+3.3V ~ +5V ±5%VDC @ 0-100mA	
Atom clock connector 原子钟接口	K505		MCX female (MCX 母头),50Ω	
Hardware Interface 硬件接口			2×10 pin male connector (20 针公头) pin pitch 2mm (针脚间距 2mm)	
Physical 物理参数	K500	Size 尺寸	71.1mmX40.7mmX10.6mm	with connectors (含接头)
	K501	Size 尺寸	71.1mm×45.7mm×10.6mm	
	K501G			

K500, K501, K501G AND K505 SPECIFICATION/K500, K501, K501G 和 K505 规范

	K505		
	K500	Weight 重量	19 grams 克
	K501	Weight 重量	25 grams 克
	K501G	Weight 重量	24 grams 克
	K505	Weight 重量	25 grams 克

Note 1

Some of K500 OEM boards don't support GLONASS.

某些 K500 板卡不支持 GLONASS。

II. DIMENSION/尺寸

In this section, three-side views and the dimension of K500, K501, K501G and K505 are provided for customers' further hardware design and installation.

本节提供了 K500、K501、K501G 和 K505 的三视图和对应的物理尺寸，便于用户的进一步系统硬件设计和安装。

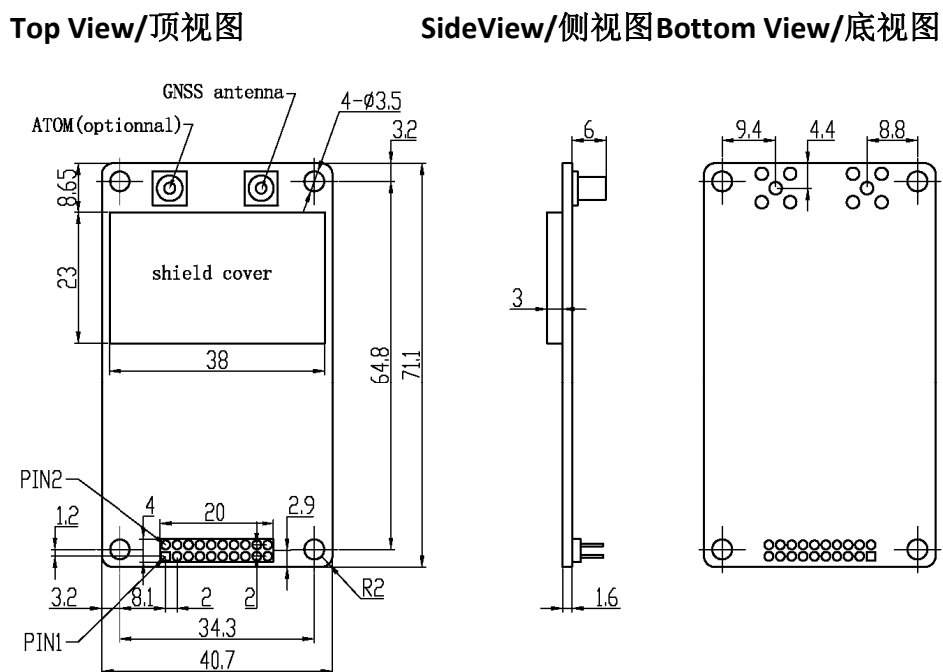


Figure 1. K500 Dimensional Drawing

Top View/顶视图 SideView/侧视图Bottom View/底视图

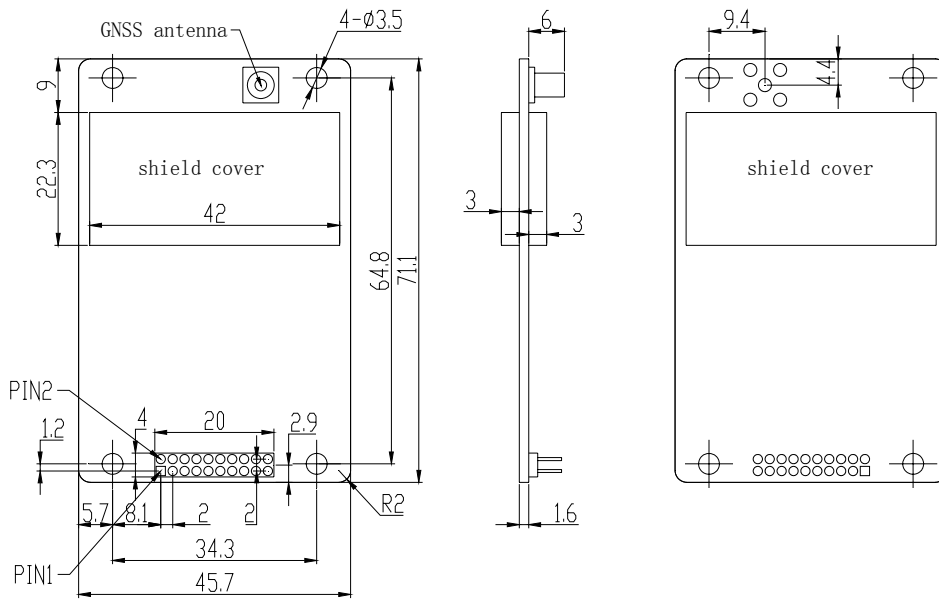


Figure 2. K501/K501G Dimensional Drawing

Top View/顶视图 SideView/侧视图Bottom View/底视图

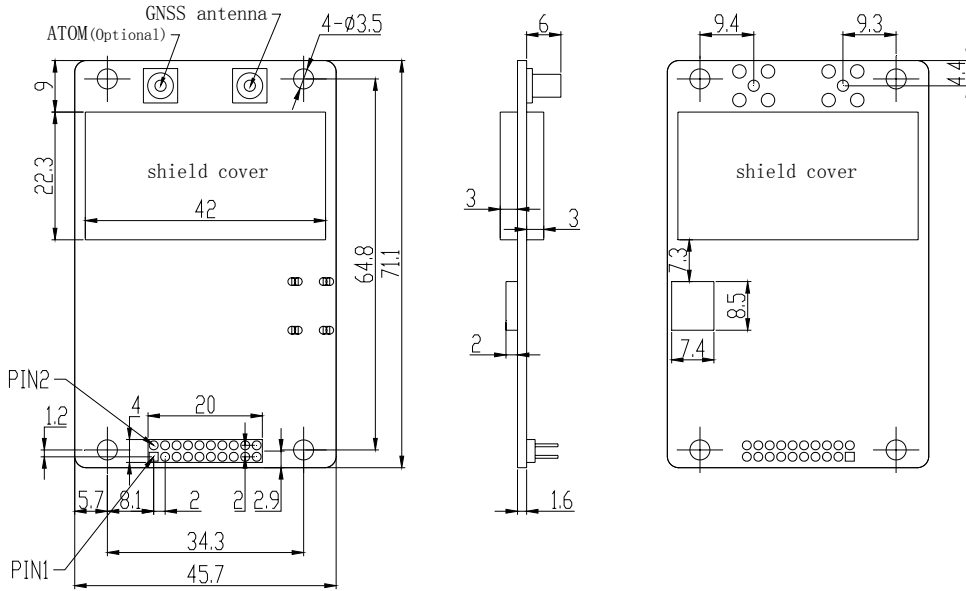


Figure 3. K505 Dimensional Drawing

TIPS 提示:

The copies of four AutoCAD dwg files as shown in Figure 1, Figure 2 and Figure 3 can be obtained from the attachment of this document, which can be imported into EDA tools directly facilitating your system hardware design.

该文档的附件包含上面三幅图的 AutoCAD dwg 文件，可直接导入 EDA 软件用于系统硬件设计。

III. PIN ARRANGEMENT AND DEFINITION/引脚标识和定义

Pin definitions of K500, K501, K501G and K505 are listed in Table 2, Table 3, Table 4 and

Table 5 respectively.

表 2~5 中为这些引脚的具体定义。

Table 2. K500 20-Pin Definition

PIN	SIGNAL	TYPE	DESCRIPTION	
1	LNA_PWR	PWR	Antenna power Supply	天线供电
2	VIN	PWR	Supply voltage input	电源电压输入
3	NC	N/A	No Connection	未连接
4	COM3_Rx	Input	UART3 RX	COM3 串口输入
5	RESETIN	Input	System reset	系统复位
6	VARF	O	10MHz square wave output	10MHz 方波输出
7	Event	Input	EVENT mark	外部事件输入
8	RTK_LED	Output	RTK data LED indicator	RTK 数据指示灯
9	COM3_Tx	Output	UART3 TX	COM3 串口输出
10	GND	PWR	Ground Reference	系统接地
11	COM1_Tx	Output	UART1 TX	COM1 串口输出
12	COM1_Rx	Input	UART1 RX	COM1 串口输入
13	GND	PWR	Ground Reference	系统接地
14	COM2_Tx	Output	UART2 TX	COM2 串口输出
15	COM2_Rx	Input	UART2 RX	COM2 串口输入
16	GND	PWR	Ground Reference	系统接地

PIN	SIGNAL	TYPE	DESCRIPTION	
17	RFU	N/A	Reserved for use	预留
18	GND	PWR	Ground Reference	系统接地
19	PPS	O	Pulse per second	秒脉冲
20	SAT_LED	O	Tracked satellite number indicator	跟踪卫星数量指示灯

Table 3. K501 20-Pin Definition

PIN	SIGNAL	TYPE	DESCRIPTION	
1	LNA_PWR	PWR	Antenna power Supply	天线供电
2	VIN	PWR	Supply voltage input	电源电压输入
3	NC	N/A	No Connection	未连接
4	COM3_Rx	Input	UART3 RX	COM3 串口输入
5	RESETIN	Input	System reset	系统复位
6	NC	N/A	No Connection	未连接
7	Event	Input	EVENT mark	外部事件输入
8	RTK_LED	Output	RTK data LED indicator	RTK 数据指示灯
9	COM3_Tx	Output	UART3 TX	COM3 串口输出
10	GND	PWR	Ground Reference	系统接地
11	COM1_Tx	Output	UART1 TX	COM1 串口输出
12	COM1_Rx	Input	UART1 RX	COM1 串口输入
13	GND	PWR	Ground Reference	系统接地
14	COM2_Tx	Output	UART2 TX	COM2 串口输出
15	COM2_Rx	Input	UART2 RX	COM2 串口输入
16	GND	PWR	Ground Reference	系统接地
17	RFU	N/A	Reserved for use	预留
18	GND	PWR	Ground Reference	系统接地
19	PPS	O	Pulse per second	秒脉冲

PIN	SIGNAL	TYPE	DESCRIPTION
20	SAT_LED	O	Tracked satellite number indicator 跟踪卫星数量指示灯

Table 4. K501G 20-Pin Definition

PIN	SIGNAL	TYPE	DESCRIPTION
1	LNA_PWR	PWR	Antenna power Supply 天线供电
2	VIN	PWR	Supply voltage input 电源电压输入
3	NC	N/A	No Connection 未连接
4	COM3_Rx	Input	UART3 RX COM3 串口输入
5	RESETIN	Input	System reset 系统复位
6	NC	N/A	No Connection 未连接
7	Event	Input	EVENT mark 外部事件输入
8	RTK_LED	Output	RTK data LED indicator RTK 数据指示灯
9	COM3_Tx	Output	UART3 TX COM3 串口输出
10	GND	PWR	Ground Reference 系统接地
11	COM1_Tx	Output	UART1 TX COM1 串口输出
12	COM1_Rx	Input	UART1 RX COM1 串口输入
13	GND	PWR	Ground Reference 系统接地
14	COM2_Tx	Output	UART2 TX COM2 串口输出
15	COM2_Rx	Input	UART2 RX COM2 串口输入
16	GND	PWR	Ground Reference 系统接地
17	RFU	N/A	Reserved for use 预留
18	GND	PWR	Ground Reference 系统接地
19	PPS	O	Pulse per second 秒脉冲
20	SAT_LED	O	Tracked satellite number indicator 跟踪卫星数量指示灯

Table 5.K50520-Pin Definition

PIN	SIGNAL	TYPE	DESCRIPTION	
1	LNA_PWR	PWR	Antenna power Supply	天线供电
2	VIN	PWR	Supply voltage input	电源电压输入
3	NC	N/A	No Connection	未连接
4	COM3_Rx	Input	UART3 RX	COM3 串口输入
5	RESETIN	Input	System reset	系统复位
6	NC	N/A	Reserved for use	未连接
7	Event	Input	EVENT mark	外部事件输入
8	RTK_LED	Output	RTK data LED indicator	RTK 数据指示灯
9	COM3_Tx	Output	UART3 TX	COM3 串口输出
10	GND	PWR	Ground Reference	系统接地
11	COM1_Tx	Output	UART1 TX	COM1 串口输出
12	COM1_Rx	Input	UART1 RX	COM1 串口输入
13	GND	PWR	Ground Reference	系统接地
14	COM2_Tx	Output	UART2 TX	COM2 串口输出
15	COM2_Rx	Input	UART2 RX	COM2 串口输入
16	GND	PWR	Ground Reference	系统接地
17	RFU	N/A	Reserved for use	预留
18	GND	PWR	Ground Reference	系统接地
19	PPS	O	Pulse per second	秒脉冲
20	SAT_LED	O	Tracked satellite number indicator	跟踪卫星数量指示灯

REMARKS/说明:

1. Electronic characteristic/电气特性

RTK_LED, SAT_LED, RESETIN, COM1_Tx, COM1_Rx, COM2_Tx, COM2_Rx, COM3_Tx and COM3_Rx are LVCMOS 3.0V compatible. All these signals are compatible with LVCMOS/LVTTL 3.3V

RTK_LED, SAT_LED, RESETIN, COM1_Tx, COM1_Rx, COM2_Tx, COM2_Rx, COM3_Tx,

COM3_Rx是兼容3.0 V的。所有这些信号兼容LVCMOS / LVTTTL 3.3 V

Symbols 符号	Description 描述	Min 最小	Max 最大
VIH	Input high voltage 输入高电压	2.4V	——
VIL	Input low voltage 输入低电压	——	0.6V
VOH	High-level output voltage 高电平输出电压	2.7V	3.0V
VOL	Low-level output voltage 低电平输出电压	0V	0.3V
IHout	Sourcing current 拉电流	1mA	
ILout	Sinking current 灌电流	1mA	

2. K500,K505 OEM Board

PPS, EVENTandVARF are LVTTTL 3.0V compatible. All these signals are compatible with LVCMOS/LVTTTL 3.3V

PPS、EVENT和VARF 为LVTTTL 3.0 V电平，所有这些信号兼容LVCMOS / LVTTTL 3.3V

Symbols/符号	Description/描述	Min/最小	Max/最大
VIH	Input high voltage 输入高电压	2.0V	——
VIL	Input low voltage 输入低电压	——	0.8V
VOH	High-level output voltage 高电平输出电压	2.6V	3.0V
VOL	Low-level output voltage 低电平输出电压	0V	0.4V
IHout	Sourcing current 拉电流	8mA	
ILout	Sinking current 灌电流	8mA	

K501,K501G OEM Board

PPSis LVTTTL 1.8V compatible.This signalis compatible with LVCMOS/LVTTTL 1.8V

PPS为LVTTTL 1.8V电平，这个信号兼容LVCMOS / LVTTTL 1.8V

Symbols/符号	Description/描述	Min/最小	Max/最大
VOH	High-level output voltage 高电平输出电压	1.5V	1.8V
VOL	Low-level output voltage 低电平输出电压	0V	0.45V
IHout	Sourcing current 拉电流	8mA	
ILout	Sinking current 灌电流	8mA	

3. Absolute maximum rating is-0.3V~3.6Vof following signals:/所能承受电压的最大值范围是-0.3V~3.6V的信号如下:

RTK_LED,PPS,COM1_Rx,COM1_Tx,COM2_Rx,COM2_Tx,COM3_Rx,COM3_Tx,EVENT,SAT_LED,VARF,RESETIN

4. VCC

Main power supply, voltage range is 3.3VDC~5V DC.

Voltage ripple and spike requirement: <100mV

主供电电源(输入)，电压范围：3.3V~5V(直流)。电压纹波和尖峰脉冲需求：<100mV。

5. RESETIN

Low active, it can be used to reset the whole OEM board, which is 3.0V compatible.

低电平有效，可用于复位整个OEM板。

6. RTK_LED/SAT_LED

SAT_LED is used to indicate the satellite number. RTK_LED indicates that RTK is undergoing. Both RTK_LED and SAT_LED are all high active. External LED driver is needed for normal use.

RTK_LED闪烁指示接收到基准站的数据，SAT_LED指示卫星数量，一次连续闪烁的次数表示当前搜到卫星的数量。RTK_LED与SAT_LED均为高电平驱动LED，需要外加LED驱动。

IV. APPLICATION CONNECTION EXAMPLE/应用连接示例

In this section, an application connection example of K500 OEM board is presented via specific schematic diagrams. Per the instruction of these diagrams, you could easily build the communication circuits between K500 OEM board 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 K500 板卡应用连接示例。参照下面的图示，您可以很方便建立 K500 板卡和其他终端（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。

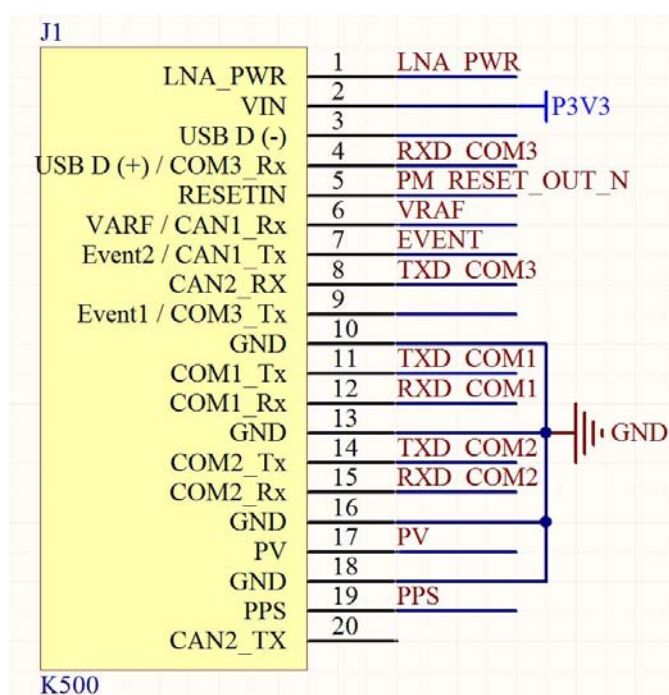


Figure 4. K500 Pin Assignment Schematic

(K500 引脚分配及外接电路示意)

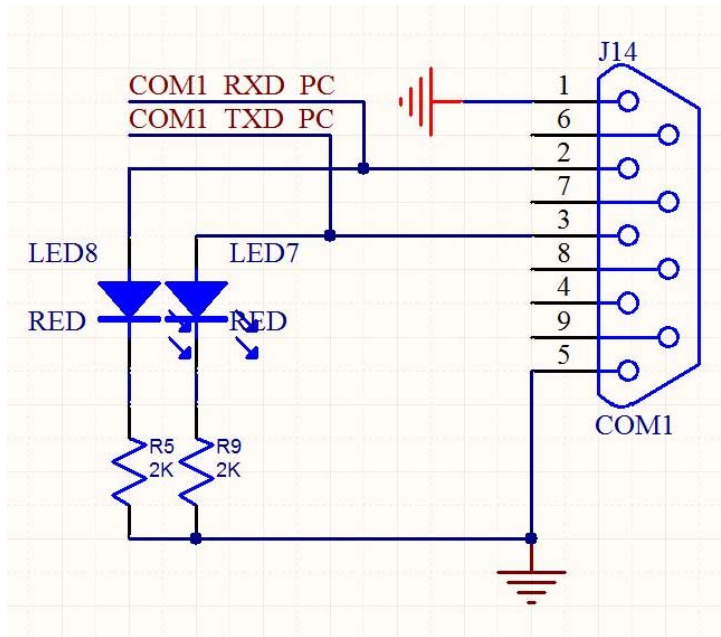


Figure 5. Connection of RS232COM1 Connector to PC

(K500RS232COM1 电平转换之后与电脑连接的接头)

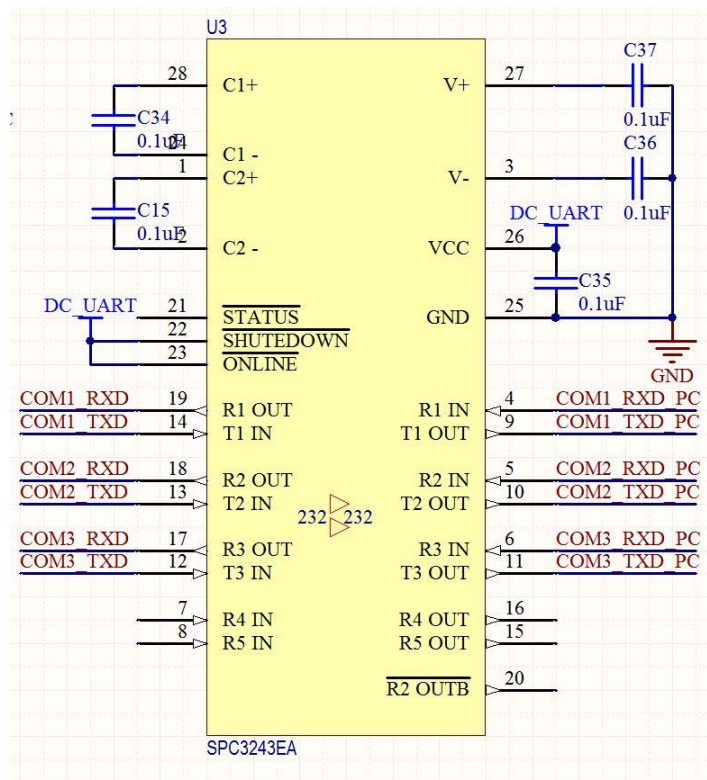


Figure 6. Connections between RS232COM1,2, 3 of K500 and some other Devices with an UART

(K500 RS232 COM1/2/3 与其他使用 UART 接口的设备之间的连接示意)