



# 司南导航

Product Specification/产品规范

## K708 OEM Board

## K708 OEM 板卡

2015-9-22

## REVISION HISTORY/修订历史

REVISION/版本	MODIFICATION/更改	DATE/日期
1.0	New Release/新发	2015-9-22

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## I. INTRODUCTION /简介

ComNav K708 is a high precision positioning GNSS multi-system OEM board based on a self-developed ASIC baseband chip (SNB1008). K708 has BeiDou tri-band ultra long-range and ultra-fast high dynamic computation capability, and a onboard large-capacity storage.

上海司南 K708 OEM 板卡是一款基于自主研发的 ASIC 基带芯片（SNB1008）的 GNSS 多系统高精度定位板卡。该板卡拥有北斗三频超远距离超快速的高动态解算能力，以及超大容量存储功能。

## II. SPECIFICATION OF K708 OEM BOARD/K708 OEM 板卡技术规范

Following table presents the detailed specification of ComNav K708 OEM board. Specific technical characteristics are listed with its physical interface and electrical parameters.

下表中为司南 K708 OEM 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. K708 Specification

K708 SPECIFICATION/ K708 规范			
GNSS Signals GNSS 信号	Positioning 定位	GPS L1C/A, L1P, L2P, L2C,L5	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
		GLONASS G1C, G2C, G1P, G2P	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
Time to First Fix 首次定位时间	Cold 冷启动		<50s
	Warm 温启动		< 45s
	Hot 热启动 (With RTC, 使用 RTC)		<15s

K708 SPECIFICATION/ K708 规范		
<b>Reacquisition</b> 信号重捕		< 1.5s (fast mode) (快速) < 3s (normal mode) (普通)
<b>Measurement Precision</b> 测量准确度	Pseudorange Precision 伪距精度	GPS: L1=10cm/L2=10cm BDS: B1=10cm/B2=10cm GLONASS: G1=20cm/G2=20cm
	Carrier Phase Precision 载波相位精度	GPS: L1=1.0mm/L2=1.0mm BDS: B1=1.0mm/B2=1.0mm GLONASS: G1=1.0mm/G2=1.0mm
<b>Accuracy</b> 精度	Time Accuracy 授时精度	20ns
	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: $\pm(2.5 + 1 \times 10^{-6} \times D)$ mm V: $\pm(5 + 1 \times 10^{-6} \times D)$ mm
<b>Attitude Accuracy</b> 测姿精度	Azimuth accuracy 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 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
<b>RTD Performance</b> RTD 性能	Pseudorange Differential Accuracy(1σ) 伪距差分精度(1σ)	H: ±0.5m V: ±1.0m
<b>RTK</b>	RTK Initiation time RTK 初始化时间	< 10s (baseline<20km, 基线长小于 20km)
	Initiation Reliability 初始化置信度	> 99.9%

K708 SPECIFICATION/ K708 规范		
	RTK Accuracy RTK 精度	H: $\pm(10 + 1 \times 10^{-6} \times D)$ mm V: $\pm(20 + 1 \times 10^{-6} \times D)$ mm
	E-RTK <sup>Note1</sup> initiation Time E-RTK 初始化时间	1s
	Initiation Reliability 初始化置信度	> 99.9%
	E-RTK Accuracy E-RTK 精度	H: $\pm(200 + 1 \times 10^{-6} \times D)$ mm V: $\pm(400 + 1 \times 10^{-6} \times D)$ mm
	<b>Data Rates</b> 数据速率	Measurements & Position 测量&定位
<b>Electrical</b> 电气特性	Data Storage Space 数据存储空 间	8GB
	Voltage 供电电压	+3.3V ~ +5.5V $\pm$ 5% DC
	Power Consumption (no antenna connected) 功耗（未接天线）	1.70 W
<b>Environmental</b> 环境要求	Operating Temperature 工作温度	-40°C — +80°C
	Storage Temperature 储存温度	-55°C — +95°C
<b>Data Formats</b> 输出数据格式	NMEA-0183	GPGGA, GPGGARTK, GPGSV, GPGLL, GPGSA, GPGST, GPHDT, GPRMC, GPVTG, GPZDA etc.
	BINEX	0x00, 0x01-01, 0x01-02, 0x01-05, 0x7d-00, 0x7e-00, 0x7f-05
	ComNav Binary 司南二进制格式	ComNav Self-Defined 司南自定义
	CMR(GPS)	CMROBS, CMRREF

K708 SPECIFICATION/ K708 规范		
	RTCM2.X	RTCM1, RTCM3, RTCM9, RTCM1819, RTCM31, RTCM59
	RTCM3.0	1002, 1003, 1004, 1005, 1006, 1007, 1008, 1010, 1011, 1012, 1019, 1020, 1104, 1033
	RTCM3.2 MSM4	1074, 1084, 1124
	Other	PTNL,PJK; PTNL,GGK; PTNL,AVR; NAVPOS
Antenna Interface 天线接口	Antenna Connector 天线连接器	MMCX female(MMCX 母头), 50Ω
	LNA Power (Internal) 天线供电电压	+5V ±2% DC @ 0-100mA
Atom clock connector 原子钟接口		MMCX female (MMCX 母头), 50Ω
Hardware Interface 硬件接口		2×22 pin male connector (44 针公头) pin pitch 2mm (针脚间距 2mm)
Physical 物理参数	Size 尺寸	60mm×100mm×9.6mm with connectors (含接头)
	Weight 重量	45 gram (克)

**Note1:** Super wide lane solution 超宽巷解

### III. DIMENSION/尺寸

In this section, three-side views and the dimension of K708 are provided for customers' further hardware design and installation.

本节提供了 K708 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。

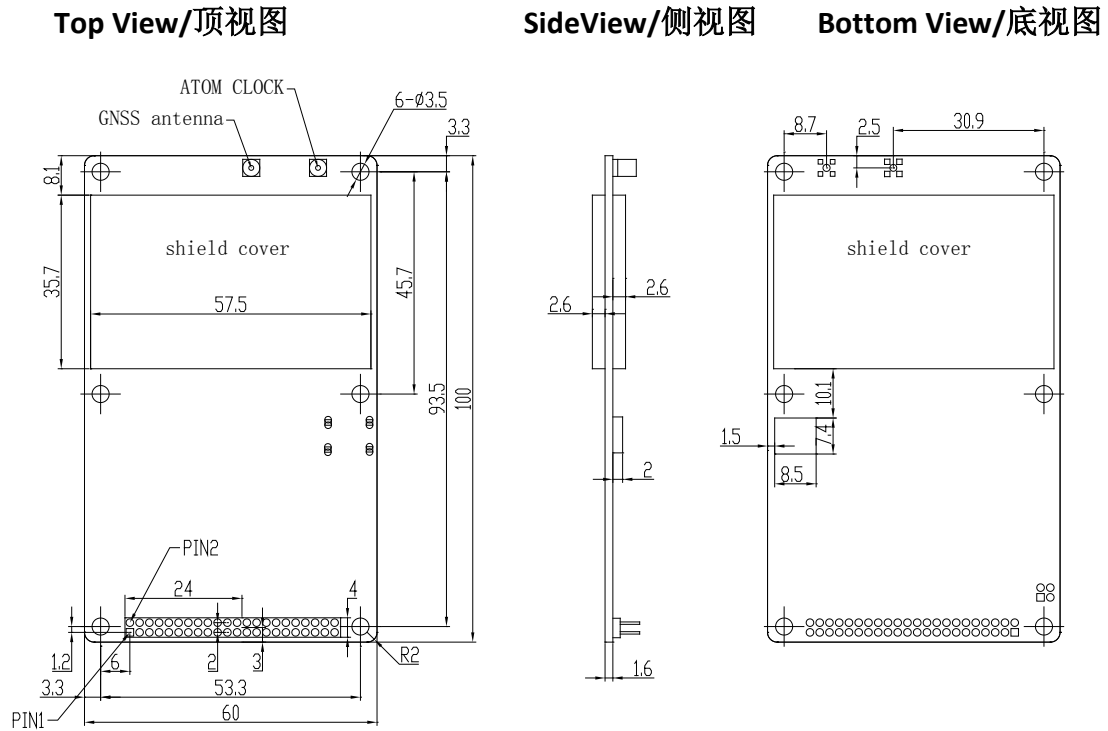


Figure 1. K708 Dimension View

**TIPS 提示:**

The copy of AutoCAD dwg files as shown in Figure 1, 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/引脚标识和定义

K708 has one 44-Pin connector (22 Pin, 2mm Dual Row vertical T/H HDR).

K708 板卡包括 44 针接头（针脚间距 2mm，双排）。

Table 2. Pin Definition of K708 44-Pin Connector

PIN	SIGNAL	TYPE	DESCRIPTION
1	GND	PWR	Ground Reference 系统接地
2	RTK_LED	O	RTK data LED indicator RTK 数据指示灯
3	RFU	N/A	Reserved for use 预留

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PIN	SIGNAL	TYPE	DESCRIPTION	
4	PPS	O	Pulse Per Second	秒脉冲
5	VCC	PWR	System power supply	系统供电电源
6	VCC	PWR	System power supply	系统供电电源
7	COM3_RX	I	UART3 RX	COM3 串口输入
8	EVENT	I	Event mark	外部事件输入
9	RFU	N/A	Reserved for use	预留
10	SAT_LED	O	Tracked satellite number indicator	跟踪卫星数量指示灯
11	VARF	O	10MHz square wave output	10MHz 方波输出
12	RESETIN	IO	System reset	系统复位
13	RFU	N/A	Reserved for use	预留
14	COM2_RX	I	UART2 RX	COM2 串口输入
15	COM4_RX	I	UART4 RX	COM4 串口输入
16	COM2_TX	O	UART2 TX	COM2 串口输出
17	COM4_TX	O	UART4 TX	COM4 串口输出
18	COM1_RX	I	UART1 RX	COM1 串口输入
19	COM3_TX	O	UART3 TX	COM3 串口输出
20	COM1_TX	O	UART1 TX	COM1 串口输出
21	USBN	IO	USB interface data (-)	USB 数据信号(-)
22	USBP	IO	USB interface data (+)	USB 数据信号(+)
23	GND	PWR	Ground reference	系统接地
24	GND	PWR	Ground reference	系统接地
25	SPI_CLK	IO	SPI clock signal	SPI 总线时钟信号
26	SPI_MISO	I	SPI MISO signal	SPI 总线数据输入信号
27	RX-_PHY	I	Ethernet receive signal (-)	以太网接收信号(-)
28	RX+_PHY	I	Ethernet receive signal (+)	以太网接收信号(+)
29	ETHER_PWR	PWR	RD magnetic center tap, 3.3V	网络变压器抽头电压, 3.3V

PIN	SIGNAL	TYPE	DESCRIPTION	
30	TX+_PHY	O	Ethernet transmit signal (+)	以太网传输信号(-)
31	TX-_PHY	O	Ethernet transmit signal (-)	以太网传输信号(+)
32	ETHER_PWR	PWR	RD magnetic center tap, 3.3V	网络变压器抽头电压, 3.3V
33	ETH_DET	O	ETHERNET detection indicator	以太网连接工作信号
34	LED_SPD	O	ETHERNET 10M/100M indicator	以太网 10M/100M 速度信号
35	GND	PWR	RFU	系统接地
36	CAN1_TX	O	CAN1 RX	CAN1 数据接收信号
37	CAN1_RX	I	CAN1 TX	CAN1 数据发送信号
38	CAN2_TX	O	CAN2 RX	CAN2 数据接收信号
39	CAN2_RX	I	CAN2 TX	CAN2 数据发送信号
40	PPS_BDS	O	BDS Pulse Per Second output	北斗系统秒脉冲输出
41	VBUS	I	VBUS for USB detection	USB 线缆接入指示信号
42	GND	PWR	Ground reference	系统接地
43	SPI_CS0	O	SPI CS signal	SPI 总线片选信号
44	SPI_MOSI	O	SPI MOSI signal	SPI 总线数据输出信号

### REMARKS/说明:

1. CAN are not available now.

CAN目前不可用。

2. Electronic characteristic/电气特性

RTK\_LED, SAT\_LED, COM2\_Tx, COM2\_Rx, COM3\_Tx, COM3\_Rx, CAN1\_RX, CAN1\_TX, CAN2\_TX, CAN2\_RX, RESETIN, SPI\_CLK, SPI\_CS, SPI\_MOSI, SPI\_MISO, LED\_SPD, LED\_DET are LVCMOS 3.3V. COM4\_Tx and COM4\_Rx are LVCMOS 1.8V

RTK\_LED, SAT\_LED, COM2\_Tx, COM2\_Rx, COM3\_Tx, COM3\_Rx, CAN1\_RX, CAN1\_TX, CAN2\_TX, CAN2\_RX, RESETIN, SPI\_CLK, SPI\_CS, SPI\_MOSI, SPI\_MISO, LED\_SPD, LED\_DET 为LVCMOS 3.3V电气标准。COM4\_Tx, COM4\_Rx为LVCMOS 1.8V电气标准。

**LVC MOS 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	2V	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	

**LVC MOS 1.8V电气标准**

Symbols 符号	Description 描述	Min 最小	Max 最大
V <sub>IH</sub>	Input high voltage 输入高电平	1.3V	2.1V
V <sub>IL</sub>	Input low voltage 输入低电平	-0.3V	0.4V
V <sub>OH</sub>	High-level output voltage 高电平输出电压	1.4V	--
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	

3. PPS, EVENT and VARF are LVTTTL 3.3V All these signals are compatible with LVC MOS/LVTTTL 3.3.

PPS、EVENT和VARF为LVTTTL 3.3 V电平，所有这些信号兼容LVC MOS / LVTTTL 3.3V。

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

Symbols/符号	Description/描述	Min/最小	Max/最大
$I_{OH}$	Sourcing current 拉电流	8mA	
$I_{OL}$	Sinking current 灌电流	8mA	

4. Absolute maximum rating is -0.3V~3.6V of 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, SAT\_LED, COM2\_Rx, COM2\_Tx, COM3\_Rx, COM3\_Tx, COM4\_Rx, COM4\_Tx, EVENT, PPS, PPS\_BDS, VARF, RESETIN, CAN2\_Rx, CAN2\_Tx, CAN1\_Rx, CAN1\_Tx, SPI\_CLK, SPI\_CS, PI\_MOSI, SPI\_MISO, LED\_SPD, LED\_DET.

5. COM1\_Tx and COM1\_Rx are RS232 compatible and can communicate with computer directly. COM4\_Tx and COM4\_Rx are LVCMOS 1.8V. CAN is LVTTTL 3.3V, so a transceiver is needed for normal use.

COM1\_Tx和COM1\_Rx 为RS232电平，可直接与电脑通讯。COM4\_Tx 和COM4\_Rx是LVCMOS 1.8V。CAN是LVTTTL 3.3V，所以需要有一个收发器才能正常使用。

6. USB

K708 USB has a built-in PHY. The unit supports USB 2.0 Device configuration at low/full/high speed configuration .The port has ESD protection, but a USB 2.0 compliant common mode choke should be added near the USB connector if better EMI performance is needed.

VBUS is only used for USB cable plug-in detection as an input IO. You can connect VBUS directly to USB connector.

K708使用内建PHY，可配置为低速/全速/高速USB设备。接口有做ESD防护，如果需要获得较好的EMC表现，可以在接插件处增加安装共模电感。

VBUS用作USB线缆接入检测，直接将VBUS引脚连接到USB接插件的VBUS引脚。

7. ETHERNET

LAN8720 is used by K708 as a network transceiver, with 10M/100M Ethernet communication function and the default setting is 100M full-duplex communications. It also has auto-negotiation function. OEM board does not have any internal magnetics and ESD protection. Additional magnetics and TVS diode are required to ensure a stable and secure Ethernet network communication.

Thanks to LAN8720 transceivers, K708 has the capabilities of communication detection and

speed indication. LED\_DET and LED\_SPD are low trigger.

K708 使用LAN8720作为网络收发器，具备10M/100M以太网通讯功能，默认设置为100M全双工通讯，具备自动诊断及自适应线缆功能。OEM板卡内部不包含网络变压器以及ESD保护措施，需要额外的网络变压器以及TVS二极管确保稳定安全的以太网网络通讯。

得益于LAN8720收发器，K708具备以太网线通讯检测与速度指示功能。LED\_DET与LED\_SPD均为低电平触发。

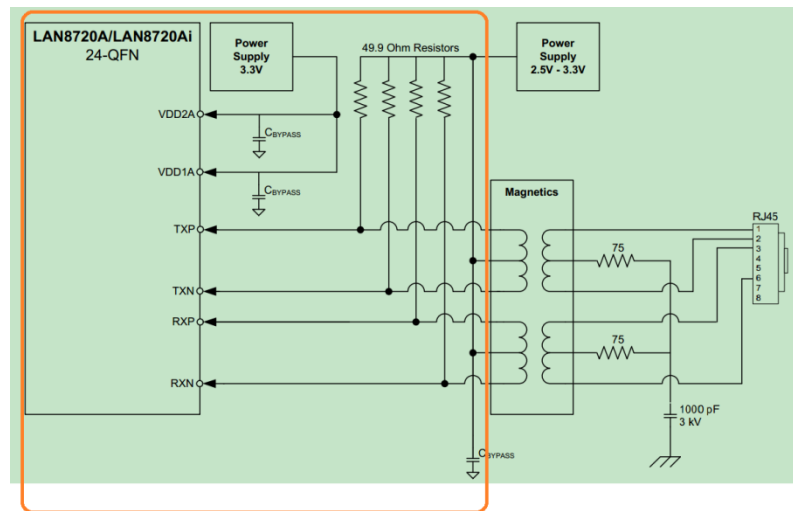


Figure 2. LAN8720 connection diagram

(LAN8720连接框图)

## 8. VCC

Main power supply, voltage range is 3.3VDC~5.5V DC.

Voltage ripple and spike requirement: <100mV

主供电电源(输入)，电压范围：3.3V~5.5V(直流)。电压纹波和尖峰脉冲需求：<100mV。

## 9. 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。

## 10. 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。

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

In this section, an application connection example of K708 OEM board is presented via specific schematic diagrams. Per the instruction of these diagrams, you could easily build the communication circuits between K708 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 K708 板卡应用连接示例。参照下面的图示，您可以很方便建立 K708 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。

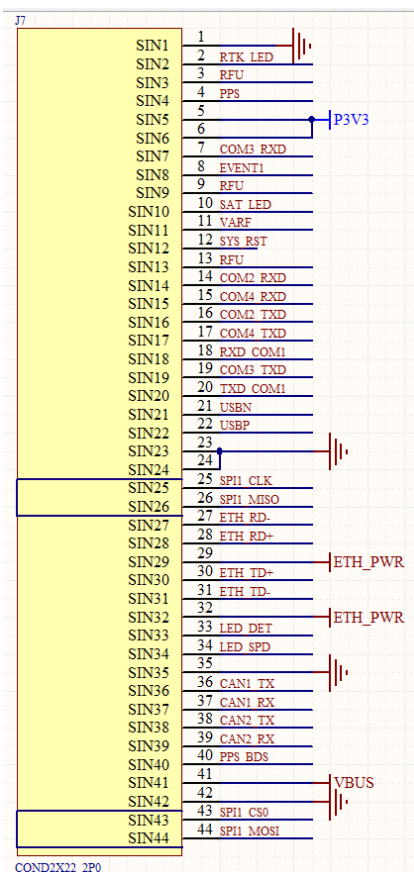


Figure 3. K708 Pin Assignment Schematic

(K708 引脚分配及外接电路示意)

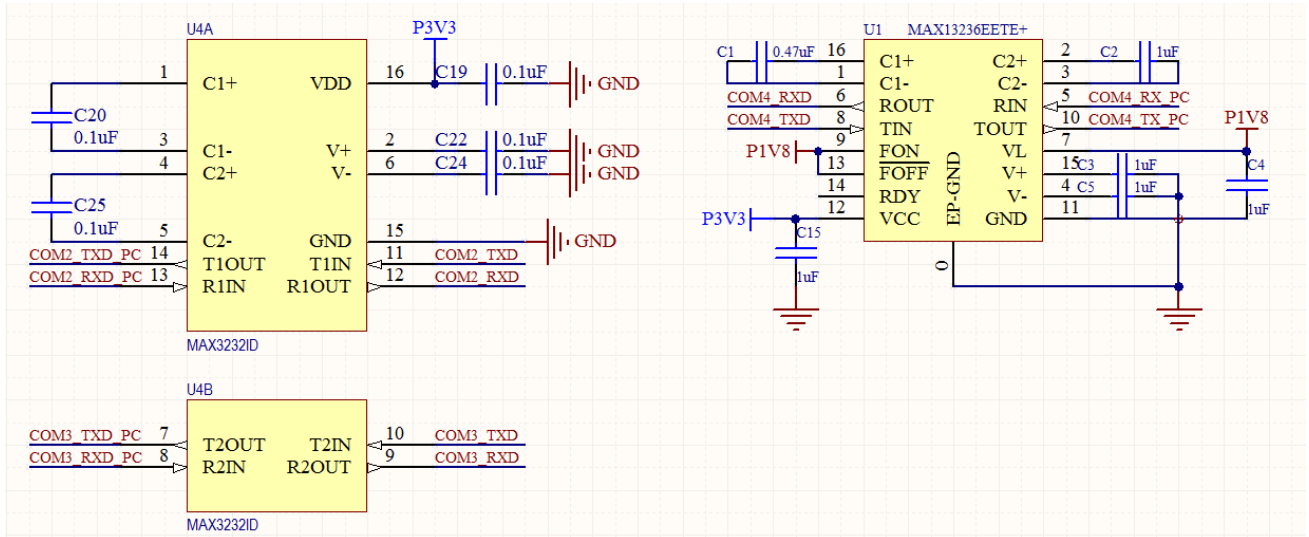


Figure 4. Connections between RS232 COM2, 3, 4 of K708 and some other Devices with an UART

(K708 RS232 COM2/3/4 与其他使用 UART 接口的设备之间的连接示意)

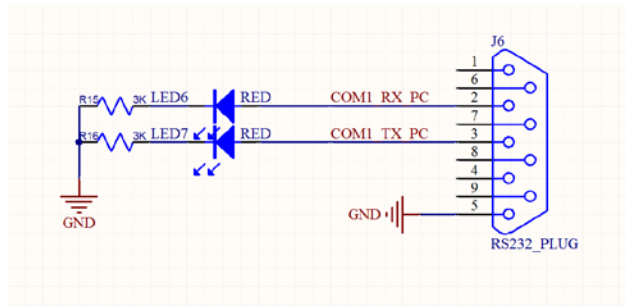


Figure 5. Connection of RS232 COM1 Connector to PC

(K708 RS232 COM1 电脑连接的接头)

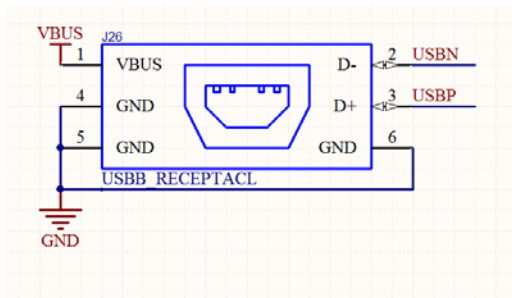


Figure 6. USB connection

(USB 连接)

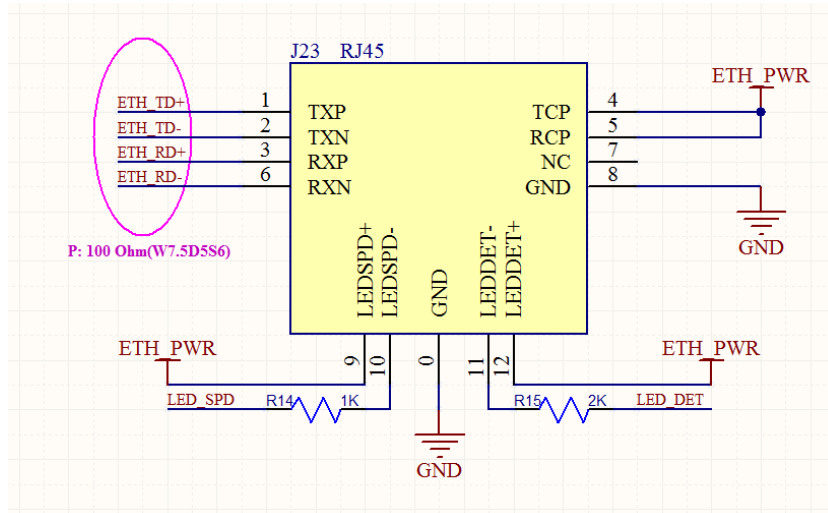


Figure 7. Network connection

(网络连接)

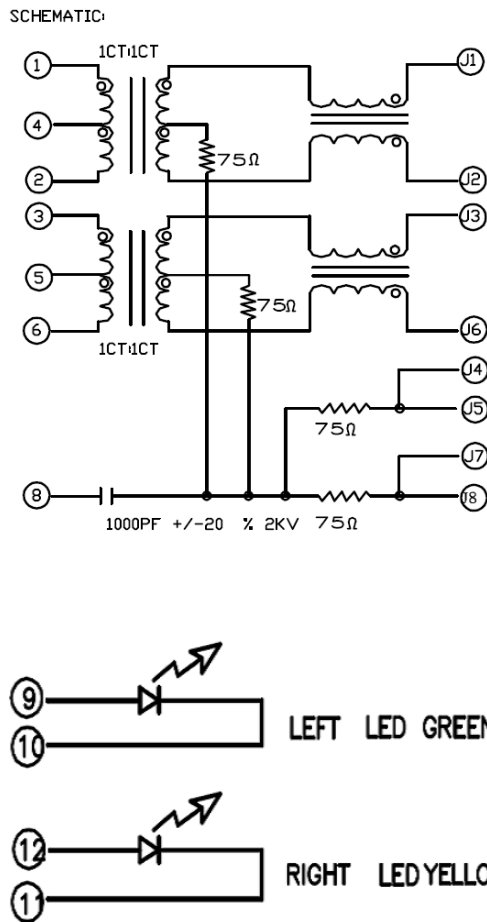


Figure 8. RJ45 Schematic

(RJ45 原理图)