



# PRODUCT SPECIFICATION

# 产品规范

适用于 For  
RD02 GNSS 模块  
RD02 GNSS Module



INTRODUCTION

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## REVISION HISTORY / 修订历史

Revision/版本	Modification/更改	Date/日期
1.0	New Release. / 新发	2023/9/4
1.1	Modify the pin position / 修改引脚位置	2024/11/6

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# 1. Introduction / 简介

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The RD02 module is an OEM module independently developed by SinoGNSS ,Which supports RDSS transceiver integration.It is Integrated with LNA, RDSS RF transceiver chip, 5W power amplifier, and BD-3 dedicated baseband circuit, it can achieve BD-3 RDSS communication and positioning function.The RD02 module has the characteristics of simple application, high integration, small size, and low power consumption.It can be widely used in various BD RDSS communication terminals, including vehicle mounted, handheld, data transmission, etc.

The features of RD02 product are :

Capable of processing RDSS signals in China and global regions;

Compatible with the BD2 short message communication system, with the function of receiving S-band outbound signals and generating L-band inbound signals;

A single message can send up to 1000 Chinese characters;

Built in LNA and 5W power amplifier units, can be directly connected to the antenna for using;

40 × 40mm min size module, easy to integrate;

RD02模块是司南导航自主研发的支持RDSS收发一体OEM模块。集成了 LNA、RDSS 射频收发芯片、5W功放、北斗三号专用基带电路等，可以实现北斗三号RDSS通信定位功能。RD02模块应用简单、集成度高、体积小、功耗低等特点。可以广泛地应用于各类北斗RDSS 通信终端，包括车载型、手持型、数传型等。

RD02产品特点如下：

可处理中国及全球地区范围 RDSS 信号；

兼容 BD2 短报文通信系统，具有接收S频段出站信号功能，以及具有生成L频段入站信号功能；

单条报文最多可发送1000个汉字；

内置LNA和5W功放单元，可直接接天线使用；

40×40mm小尺寸模块，易于集成；

## 1.1. Product Characteristics / 产品特性

Table 1. Product Characteristics / 产品特性

RD02 SPECIFICATION/ RD02 规范		
Signal Reception RDSS 信号接收	Receive Signal Type 接收信号类型	Receive S1I, S2C_d Outbound Signal Frequency range: 2491.75 ±8.16MHz 接收S1I、S2C_d出站信号 频率范围: 2491.75±8.16MHz
	Reception Sensitivity 接收灵敏度	1. When the stationary overshoot signal is less than or equal to -127.6 dBm, the error rate: $\leq 1 \times 10^{-5}$ 2. RDSS message branch of BDS-3: Private segment 24 Kbps information frame ,the error rate: $\leq 1E-5$ (signal power - 123.8 dBm); Private segment 16 Kbps information frame, the error rate: $\leq 1E-5$ (signal power - 127.5 dBm); Private segment 8kbps information frame, the error rate: $\leq 1E-5$ (signal power -130 dBm) 1.平稳过度信号小于等于-127.6dBm 时, 误码率: $\leq 1 \times 10^{-5}$ 2.北斗三号RDSS 电文支路: 专用段 24kbps 信息帧, 误码率: $\leq 1E-5$ (信号功率-123.8 dBm) ; 专用段 16kbps 信息帧, 误码率: $\leq 1E-5$ (信号功率-127.5 dBm) ; 专用段 8kbps 信息帧, 误码率: $\leq 1E-5$ (信号功率-130 dBm)
	First Capture Time 首次捕获时间	$\leq 2s$
	Reacquisition 失锁重捕	< 1s (Signal interrupt 30s, recapture time no more than 1s,信号中断 30s, 重捕获时间不超过1s)
	Signal Capture Sensitivity	-130dBm

RD02 SPECIFICATION/ RD02 规范		
	信号捕获灵敏度	
	Number of Simultaneous Beams Received 同时接收波束个数	≥10
	Channel Time Difference Measurement Error 通道时差测量误差	≤5ns (1σ)
	Device Bidirectional Zero 设备双向零值	1ms±5ns
	Precision of Launch Time Synchronization 发射时间同步精度	≤5ns (1σ)
	Transmitted Signal Type 发射信号类型	Launch Lf0, Lf1, Lf2 inbound signals Frequency Range: 1610~1624MHz 发射 Lf0、Lf1、Lf2 进站信号 频率范围: 1610~1624MHz
RDSS Signal Emission RDSS 信号发射	RDSS Transmit Power EIRP Value RDSS 发射功率EIRP值	6dBW ~ 8dBW
	Emission Frequency Accuracy 发射频率准确度	≤5×10 <sup>-7</sup>
	Launch Signal Carrier Suppression 发射信号载波抑制度	≥30dBc
	Modulation Phase Error of Transmitted Signal 发射信号调制相位误差	≤3°
	Electrical 电气特性	Input Voltage 输入电压

RD02 SPECIFICATION/ RD02 规范		
	Static Power 静态功耗	1.65W
	Power Amplifier Power Supply 功放供电	+5V
	Emission Current 发射电流	≤1A
Environmental 环境要求	Operating Temperature 工作温度	-40°C~+70°C
	Storage Temperature 储存温度	-45°C~+90°C
Short Message Communication 短报文通信	Support BDS-2 message length 支持北斗二号单次报文长度	120 Chinese Characters 120 汉字
	Supporting BDS-3 Regional Short Message 支持北斗三号区域短报文	1000 Chinese Characters 1000 汉字
Hardware Interface 硬件接口		LGA (94PIN)
Physical 物理参数	Size 尺寸	40mm×40mm×7mm
	Weight 重量	12.0 g

## 2. Size / 尺寸

本节提供了RD02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. RD02 Product Photo / RD02 实物图

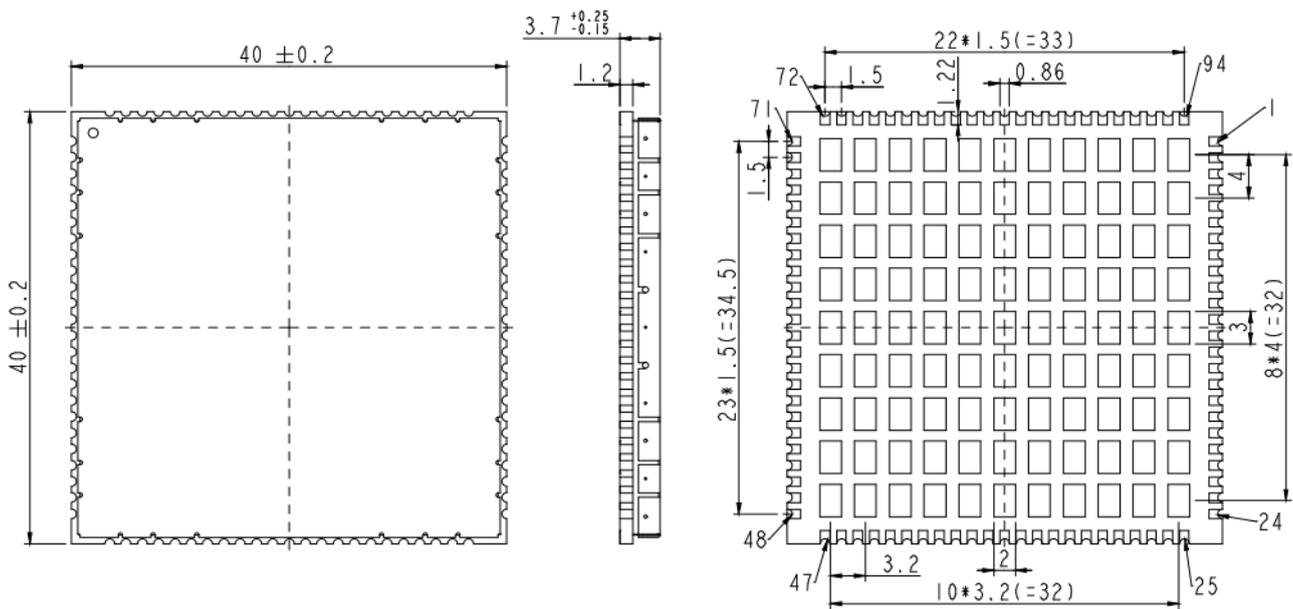


Figure 2. RD02 Dimension View / RD02 三视图

### 提示:

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。

### 3. Pin Arrangement and Definition / 针脚标识和定义

RD02模块包括94PIN,直接贴片式模块。

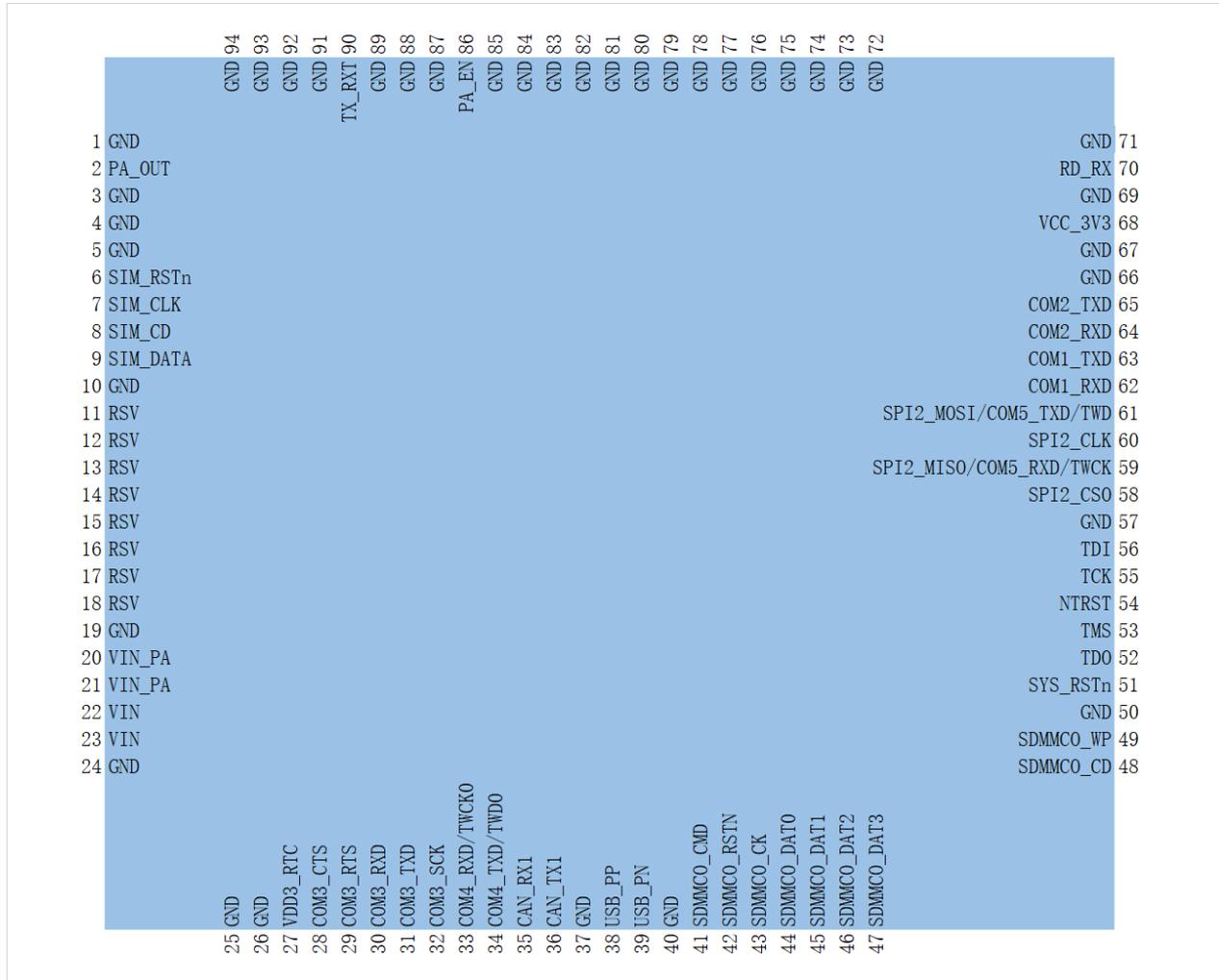


Figure 3. Pin drawing of RD02 Module(Front view)/ RD02 模块引脚(正视图)

Table 2. Pin Definition of RD02 94-Pin Pad / RD02 94针脚焊盘的针脚定义

PIN	SIGNAL	TYPE	DESCRIPTION	
1	GND	GND	Ground Reference	参考地
2	PA_OUT	O	L frequency point signal output port	L频点信号输出端口
3~5	GND	GND	Ground Reference	参考地
6	SIM_RSTn	I	SIM reset	SIM卡复位信号
7	SIM_CLK	O	Clock signal for SIM	SIM卡时钟信号
8	SIM_CD	I	Card detected signal for SIM	SIM卡检测信号
9	SIM_DATA	I/O	SIM data	SIM卡数据
10	GND	GND	Ground Reference	参考地
11-18	RSV		Reserve	保留管脚
19	GND	GND	Ground Reference	参考地
20	VIN_PA	PWR(I)	Power amplifier power input port (5.0V)	功放电源输入端口 (5.0V)
21	VIN_PA	PWR(I)	Power amplifier power input port (5.0V)	功放电源输入端口 (5.0V)
22	VIN	PWR(I)	Module power supply port (3.3-5.0V)	模块供电端口 (3.3-5.0V)
23	VIN	PWR(I)	Module power supply port (3.3-5.0V)	模块供电端口 (3.3-5.0V)
24~26	GND	GND	Ground Reference	参考地
27	VDD3_RTC	PWR(I)	Power supply for internal RTC	外接RTC电池
28	COM3_CTS	O	Clear to send for COM3	COM3清除发送
29	COM3_RTS	O	Request to send for COM3	COM3请求发送
30	COM3_RXD	I	Received data for COM3 input	COM3串口输入
31	COM3_TXD	O	Received data for COM3 output	COM3串口输出
32	COM3_SCK	O	Serial clock signal for COM3	COM3串行时钟信号
33	COM4_RXD/	I/O	Received data for COM4 input/	COM4串口输入/

PIN	SIGNAL	TYPE	DESCRIPTION	
	TWCK0		I2C SCL	I2C时钟信号
34	COM4_TXD/ TWD0	I/O	Received data for COM4 output/ I2C SDA	COM4串口输出/I2C数据信号
35	CAN_RX1	I	CAN1 input	CAN1数据接收信号
36	CAN_TX1	O	CAN1 output	CAN1数据发送信号
37	GND	GND	Ground Reference	参考地
38	USB_PP	I/O	USB interface data (+)	USB数据信号 (+)
39	USB_PN	I/O	USB interface data (-)	USB数据信号 (-)
40	GND	GND	Ground Reference	参考地
41	SDMMCO_CMD	I/O	SD command signal	4bit SDIO接口(命令、时钟、复位、检测、写保护、数据)
42	SDMMCO_RSTN	I/O	SD reset	
43	SDMMCO_CK	I/O	Clock signal for SD	
44	SDMMCO_DAT0	I/O	SDMMCO_DAT0	
45	SDMMCO_DAT1	I/O	SDMMCO_DAT1	
46	SDMMCO_DAT2	I/O	SDMMCO_DAT2	
47	SDMMCO_DAT3	I/O	SDMMCO_DAT3	
48	SDMMCO_CD	I/O	Card detected signal for SD	
49	SDMMCO_WP	I/O	SD write protect	
50	GND	GND	Ground Reference	参考地
51	SYS_RSTn	I	System reset	系统复位信号
52	TDO	O	Test data output	测试数据输出信号
53	TMS	I	Test mode selection input	测试模式选择输入
54	NTRST	I	Reset	复位信号
55	TCK	I	Test clock input	测试时钟输入信号
56	TDI	I	Test data input	测试数据输入信号
57	GND	GND	Ground Reference	参考地
58	SPI2_CS0	O	Chip select for SPI	SPI片选信号
59	SPI2_MISO/	I	SPI_MISO/	SPI输入/

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PIN	SIGNAL	TYPE	DESCRIPTION	
	COM5_RXD/ TWCK		Received data for COM5 input/ I2C SCL	COM5串口输入/ I2C时钟信号
60	SPI2_CLK	O	Clock signal for SPI	SPI时钟信号
61	SPI2_MOSI/ COM5_TXD/ TWD	O	SPI_MOSI/ Received data for COM5 output/ I2C SDA	SPI输出/ COM5串口输出/ I2C数据信号
62	COM1_RXD	I	Received data for COM1 input	COM1串口输入
63	COM1_TXD	O	Transmitted data for COM1 output	COM1串口输出
64	COM2_RXD	I	Received data for COM2 input	COM2串口输入
65	COM2_TXD	O	Transmitted data for COM2 output	COM2串口输出
66~67	GND	GND	Ground Reference	参考地
68	VCC_3V3	O	Receiving External low-noise power supply (Reserved)	接收外部低噪放供电（预留）
69	GND	GND	Ground Reference	参考地
70	RD_RX	I	Rf input signal	射频输入信号
71~85	GND	GND	Ground Reference	参考地
86	PA_EN	O	External PA is enabled	外部PA使能
87~89	GND	GND	Ground Reference	参考地
90	TX_EXT	O	L frequency point signal output port, plus PA	L频点信号输出端口，需外加PA
91~94	GND	GND	Ground Reference	参考地

### 3.1. Remarks / 说明

#### 1. 电气特性

COM1 / 2 / 3 / 4 / 5 (TX&RX), SPI2 , CAN , SDIO×9 , SYS\_RSTn 和 SIM×4 为LVCMOS 3.3V电平, 所有这些信号均兼容LVCMOS / LVTTTL 3.3V。

Table 3. LVCMOS 3.3V Electrical Standard / 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	

Table 4. LVTTTL 3.3V Electrical Standard / 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. 能承受的电压范围

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 / 4 / 5 (TX&RX), SPI2 , CAN , SDIO×9 , SYS\_RSTn 和 SIM×4 。

### 3. 供电电压

VIN 主供电电源，电压范围：3.3V ~ 5.5V（直流）。电压纹波和尖峰脉冲要求小于100mV。VIN\_PA 供电电源，电压范围：5V。

### 4. 硬件集成注意事项

- (1) 避免在 PA\_OUT 端口未接入无源天线（空载）的情况下，给 PA 电源 VIN\_PA 供电，否则可能烧毁模块。
- (2) 严格按照“电气特性”中的电压范围供电，切勿过压，否则可能把模组烧毁。建议 PA 电源（VIN\_PA）限流 3.5A 以上。
- (3) 射频管脚 RD\_RX 和 PA\_OUT 的走线需要进行50Ω的阻抗匹配，走线不要走直角或锐角，尽量不要更换信号层，而且连接下面相邻层最好有完整的地平面。
- (4) 切勿在带电的情况下插拔天线。
- (5) 建议在模块的 RD\_RX 输入前添加一个介质滤波器（推荐型号 UF2492M388）。
- (6) 为了保证模块未上电时，已连接的 IO 端口为高阻态或低电平，避免串电。可以在串口 RX 处串接 1KΩ 电阻，TX 处串接 33Ω 或者 1KΩ 电阻。

### 5. 静电防护

RD02 模块上的部分元器件易受静电影响而损坏,进而影响IC电路及其他元件。因此在使用时应注意做好静电防护措施。

- (1) 拿取模块时应尽量戴好手套或者指套以及符合静电防护标准的防静电腕带
- (2) 模块拿取过程中应只拿取模块的边缘部位，不能直接接触焊点，线路部分或者元器件，避免汗液指印污染焊点
- (3) 模块在运输过程中模块与模块间隔之间应该采用软性防护垫进行保护
- (4) 模块闲置时应放置在软性防护垫上（如防静电海绵垫等），不要随意堆叠
- (5) 模块摆放应摆放整齐有序，模块之间保持一定间隔，避免相互碰撞
- (6) 模块在使用过程中应该轻拿轻放，防止粗暴作业损坏模块
- (7) 上电时，注意电源正负极以及电压，避免反接和电压过高烧毁模块

## 4. Assembling & Repairing Note / 装配及维修说明

### 4.1. Module Assembling Note / 模块装配说明

RD02 is surface mounted, SMT welding is recommended for assembly.

RD02为表贴式模块，推荐使用SMT的焊接方式进行装配。

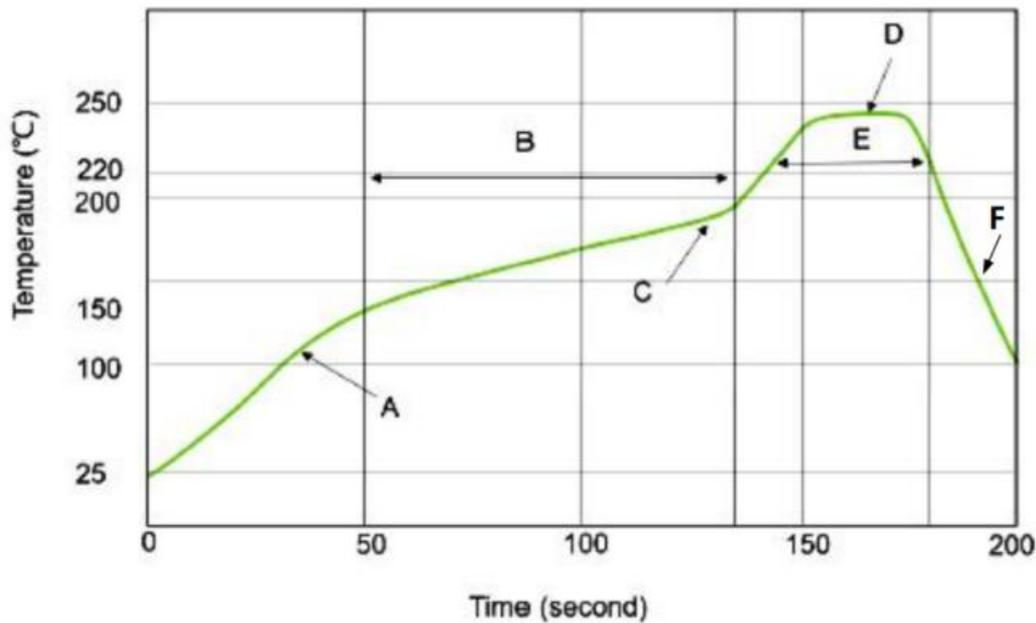


Figure 4. Furnace Temperature Curve / 炉温曲线

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 ~ 110S
- 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 ~ 80S
- 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。

#### 4.2. 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。

## 5. Application Connection Example / 应用连接示例

In this section, an application connection example of RD02 OEM Module is presented via specific schematic diagrams. Per the instruction of these diagrams, you could easily build the communication circuits between RD02 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RD02模块应用连接示例。参照下面的图示，您可以很方便建立RD02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。

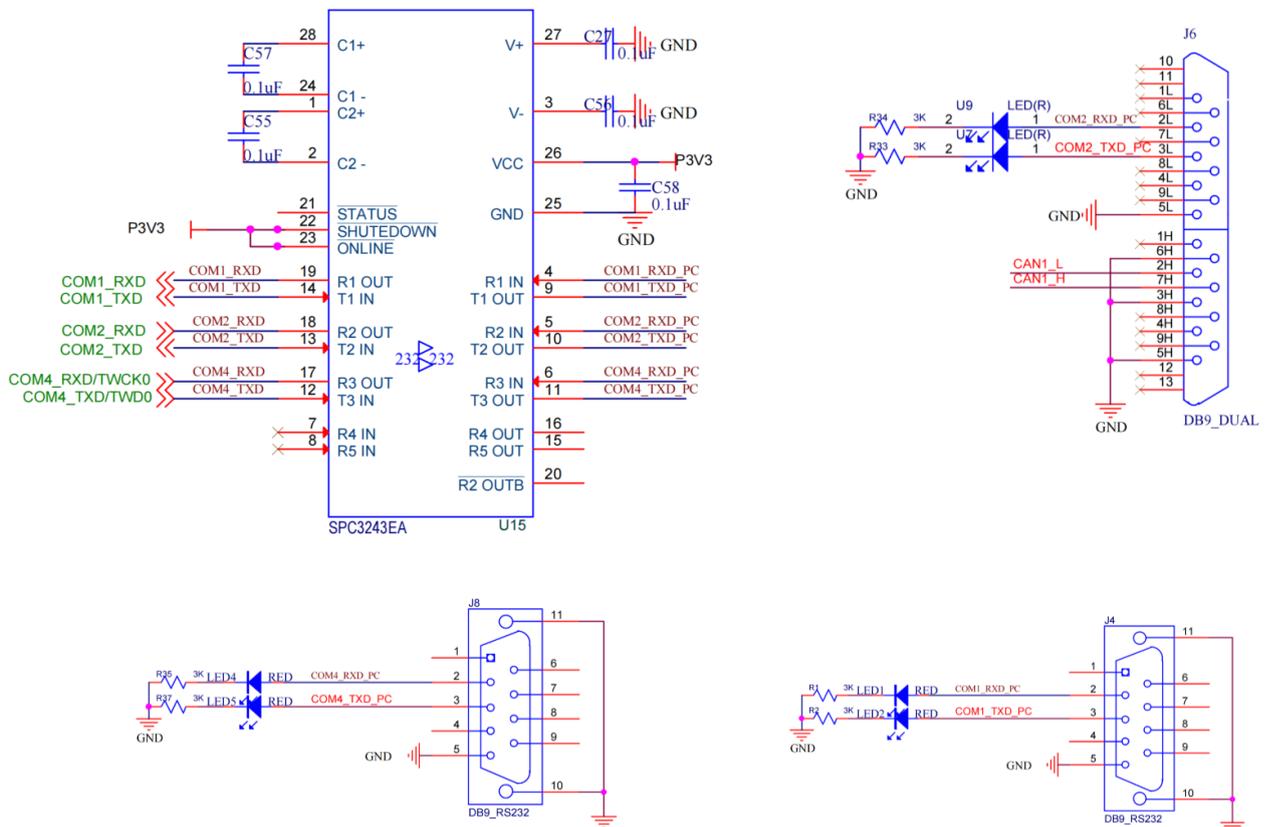


Figure 5. Connections between RS232 COM1, 2, 4 of RD02 and Some Other Devices with An UART / RD02 RS232 COM1、2、4与其他使用UART接口的设备之间的连接示意

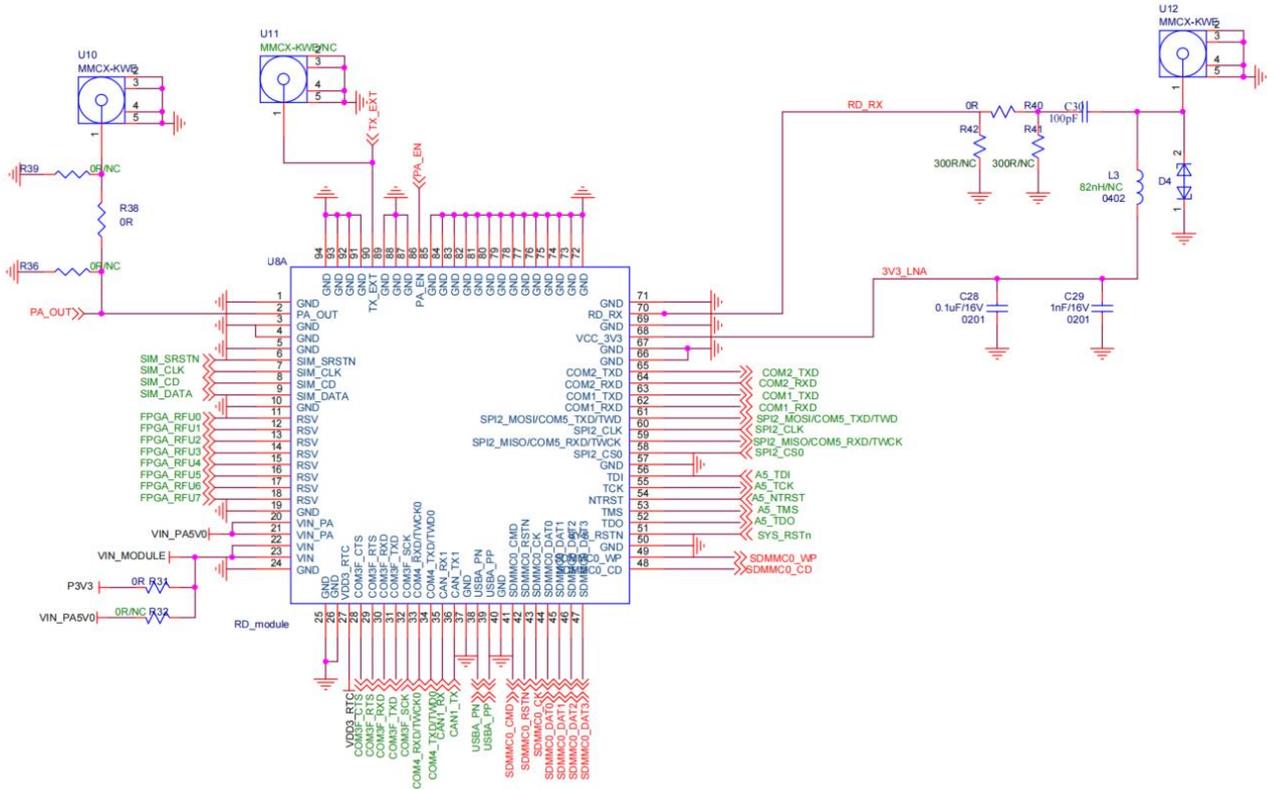


Figure 6. Minimum Hardware Design of RD02 / RD02 最小硬件设计

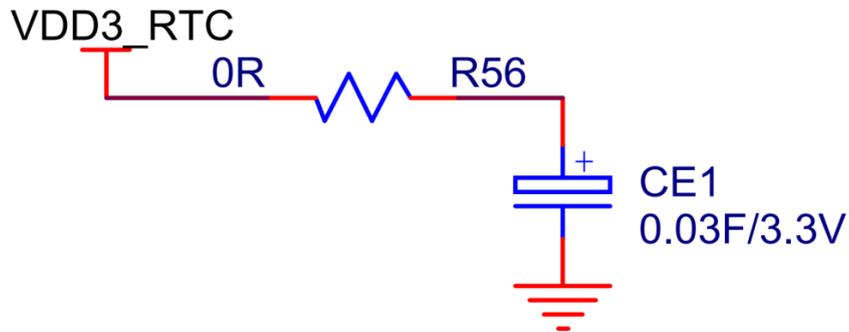


Figure 7. Recommend Design of RD02 / RD02 推荐硬件设计

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## 6. Package / 包装

Table 5. RD02 Package Description / RD02 包装说明

Project	Description
Number of Modules 模块数量	20 Slice/Roll 20 片/卷
tray Size 托盘尺寸	Tray size: length 320mm , width 136mm 托盘尺寸: 长 320mm, 宽 136mm
	Package of each module: length 22.75mm, width 17.6mm 每个模块包装: 长 40mm, 宽 40mm

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