WG237 规格书

WIFI+蓝牙V5.0 IOT模块/

WG237 Datasheet

WIFI + Bluetooth V 5.0

IOT module

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V1.01	初始发布Initial Release	Allenzhou	20230330
V1.02	增加英文版本和修改PIN16/18描述/ Add the English version and modify the PIN 16/18 description	Wendy	20230717

目录Contents

1 概述/ Brief Introduction

WG237 WiFi 模块是一款低功耗高性价比的嵌入式无线网络控制模块。可满足智能电网、 楼宇自动化、安防、智能家居、远程医疗等物联网应用的需求。

WG237 WiFi Module is an embedded wireless network control module with low power consumption and high cost performance. It can meet the needs of smart grid, building automation, security, smart home, telemedicine and other Internet of Things applications.

该模块核心处理器WG237 在较小尺寸封装中集成了业界领先的 RISC-V 32 位单核处理器，主频最高支持 120 MHz ，PCB 板载天线。

The module core processor WG237 integrates the industry-leading RISC-V 32-bit single-core processor in the smaller package, with up to 120 MHz support and PCB onboard antenna.

该模块支持标准的 IEEE802. 11 b/g/n 协议，低功耗蓝牙 5.0(Bluetooth LE)：Bluetooth 5、Bluetooth mesh。用户可以使用该模块为现有的设备添加蓝牙配网及联网功能，也可以构建独立的网络控制器。

The module supports the standard IEEE802.11 b / g / n protocol, with a low-power Bluetooth 5.0 (Bluetooth LE): Bluetooth 5, Bluetooth mesh. Users can use the module to add Bluetooth distribution network and networking functions to existing devices, or to build independent network controllers.

图1 WG237 产品图/ Figure 1 WG237 Product diagram

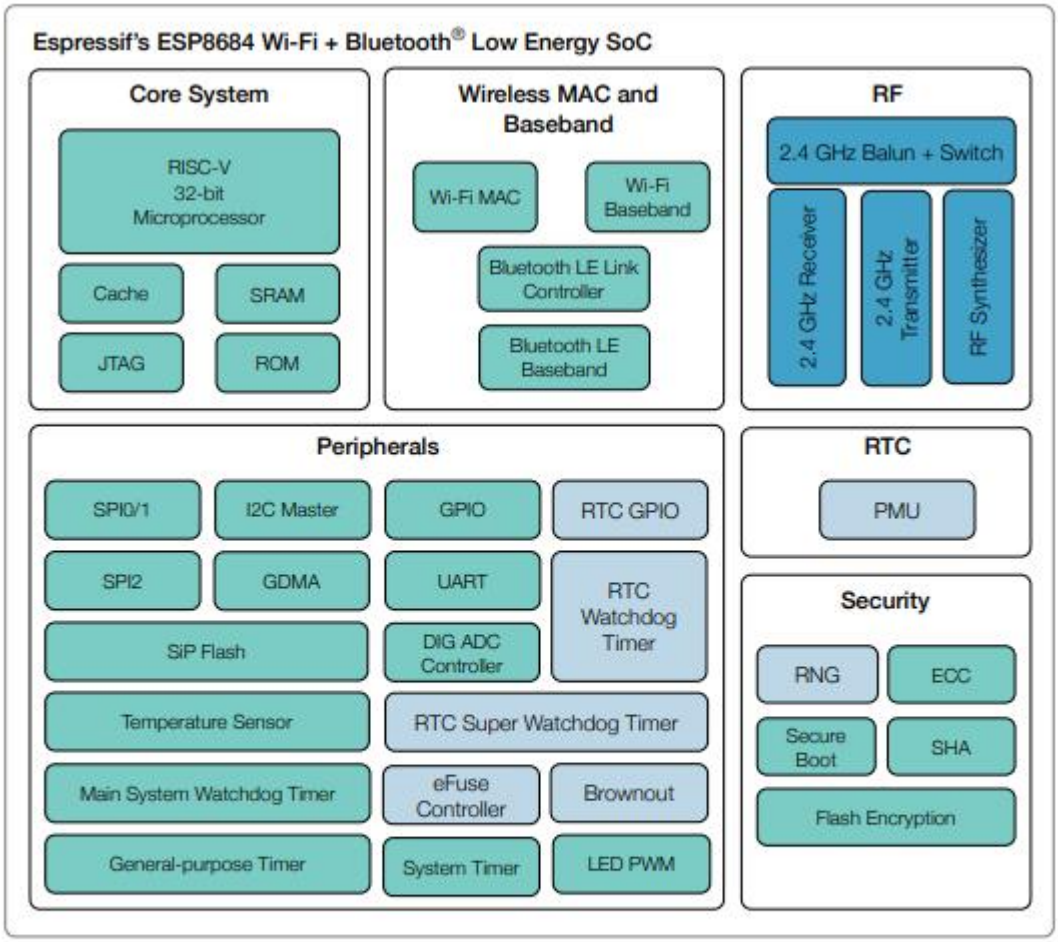
2 产品特性/ Features

- 采用 SMD-22 封装/ The SMD-22 package was used

- 板载 PCB 天线/ Onboard PCB antenna
- 工作电压： 3.3V/ Operating voltage: 3.3V
- 工作环境温度： -40-85°C/ Working environment temperature: -40-85°C
- 内置ESP32-C2 芯片，RISC-V 32 位单核微处理器，主频最高 120MHz/ Built-in ESP32-C2 chip, RISC-V 32-bit single-core microprocessor, the main frequency up to 120 MHz
  - SRAM 272KB (其中cache专用 16KB)
  - ROM 576KB
- 模组内置 Flash 2/ 4MB/ The module is built-in for Flash 2 / 4MB

- WIFI
  - 支持 IEEE 802. 11 b/g/n 协议/ The IEEE 802.11 b / g / n protocol is supported
  - 支持 1T1R 模式，数据速率高达 72Mbps/ Supports 1T1R mode with data rate up to 72Mbps
  - WIFI @2.4 GHz，支持 WEP/WPA-PSK/WPA2-PSK 安全模式/ WIFI @ 2.4 GHz, with support for the WEP / WPA-PSK / WPA 2-PSK security mode
  - 帧聚合/ Frame aggregation (TX/RX A-MPDU， RX A-MSDU)
- 蓝牙
  - 低功耗蓝牙 5.0/ Low-power Bluetooth 5.0 (Bluetooth LE)： Bluetooth 5 、Bluetooth mesh
  - 速率支持/ Rate support： 125Kbps、500Kbps、 1Mbps、 2Mbps
  - 广播扩展(Advertising Extensions)
  - 多广播(Multiple Advertisement Sets)
  - 信道选择(Channel Selection Algorithm #2)
- 硬件/ Hardware
  - 支持 GPIO*14，SPI*3，UART*2，I2C，I2S，红外收发器，PWM 控制器*6，通用 DMA 控制器，温度传感器，SAR 模/数转换器*5/ Supports GPIO * 14, SPI * 3, UART * 2, I2C, I2S, IR transceiver, PWM Controller * 6, Universal DMA Controller, temperature sensor, SAR M / DC * 5
  - 支持 STA/AP/STA+AP 工作模式。/ Supports the STA / AP / STA + AP working mode.
  - 定时器/ Timing device
    - 1x54 位通用定时器/1x54-bit universal timer
    - 2x 看门狗定时器 2x watchdog timer
    - 1x52 位系统定时器/ 1x52-bit system timer
- 支持远程 OTA/ Support for a remote OTA

3 模组框图/ Block Diagram



4 引脚描述/ Pinout Description

4.1引脚定义/The pin definition

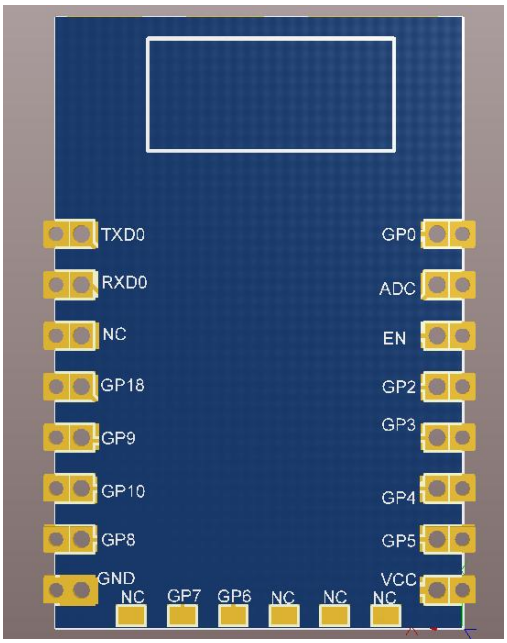


表1 PIN脚定义/Table 1 Definition of the PIN feet

序号/No.	名称/Name	描述/description
1	GP0	GPIO0, ADC1_CH0, 32.768 in
2	GP1	GPIO1, ADC1_CH1
3	EN	高电平：芯片使能；/High level: chip enabled; 低电平：芯片关闭；/Low level: chip is off; 注意不能让CHIP_EN 管脚浮空。/Note that the CHIP _ EN pin cannot float empty.
4	GP2	GPIO2, ADC1_CH2, FSPIQ
5	GP3	GPIO3, ADC1_CH3
6	GP4	GPIO4, MTMS, ADC1 CH4, FSPIHD
7	GP5	GPIO5, MTDI, FSPIWP
8	VCC	3.3V 供电；外部供电电源输出电流建议在 500mA 以上/ 3.3V power supply; the output current of external power supply is recommended to be above 500mA
9	NC	悬空/Impending
10	NC	悬空/Impending

11	NC	悬空/Impending
12	GP6	GPIO6, MTCK, FSPICLK
13	GP7	GPIO7, MTDO, FSPID
14	NC	悬空/Impending
15	GND	电源接地/Power ground
16	GP8	GPIO8（默认高电平），日志信息打印管脚，软件需要设置。/ GPIO 8 (default high level), log information print pin, software needs to set.
17	GP10	GPIO10, FSPICS0
18	GP9	GPIO9（默认高电平），烧录管脚，慎用； 启动时：高电平正常启动，低电平进入烧录模式/ GPIO 9 (default high level), burn tube feet, use with caution; When starting: the high level starts normally, and the low level enters the burning mode
19	GP18	GPIO18
20	NC	悬空/Impending
21	RXD0	U0RXD, GPIO19
22	TXD0	U0TXD, GPIO20

默认AT 固件：

WG237模组的硬件配置	UART 管脚（TX、RX、CTS、RTS）
WG237系列	GPIO7
	GPIO6
	GPIO5
	GPIO4

4.2 Strapping 管脚/ Strapping PIN

ESP32-C2 系列共有三个 Strapping 管脚。

The ESP32-C2 series has three Strapping pins.

- GPIO8
- GPIO9

软件可以读取寄存器“GPIO_STRAPPING”中这几个管脚 strapping 的值。

The software can read the values of these pin strapping in the register "GPIO _ STRAPPING".

在模组的系统复位 (上电复位、RTC 看门狗复位、欠压复位、模拟超级看门狗 (analog super watchdog) 复位、晶振时钟毛刺检测复位) 过程中，Strapping 管脚对自己管脚上的电平采样并存储到锁存器中，锁存值为“0”或“1”，并一直保持到模组掉电或关闭。

During the system reset of the module (power reset, RTC watchdog reset, undervoltage reset, simulated super watchdog (analog super watchdog) reset, crystal vibration clock burr detection reset), Strapping pin samples the level on the pin and stores it in the latch. The latch value is "0" or "1", and keeps it until the module is off or off.

GPIO9 默认连接内部上拉。如果该管脚没有外部连接或者连接的外部线路处于高阻抗状态，则锁存值为“1”。

GPIO9 Default connection internal pull-up. If the pin has no external connection or the connected external line is in a high impedance state, the latch value is "1".

为改变 Strapping 的值，您可以应用外部下拉/上拉电阻，或者应用主机 MCU 的 GPIO 控制WG237 系列上电复位时的 Strapping 管脚电平。

To change the value of Strapping, you can apply the external down / up resistance or the GPIO of the host MCU to control the Strapping pin level when the WG237 series is reset.

复位放开后，Strapping 管脚和普通管脚功能相同。

After resetting and releasing, the Strapping pin has the same function as the ordinary pin.

配置 Strapping 管脚的详细启动模式请参阅表2 。

Configuring the detailed boot mode for the Strapping pins, please refer to Table 2.

注意：部分引脚已经内部上拉，请参考原理图。

Note: Some pins have already been pulled up internally, please refer to the schematic diagram.

表 2 Strapping 管脚/ Table 2 Strapping Pins

系统启动模式 1/ System startup mode 1			
管脚/Pin	默认/Default	SPI 启动模式/SPI startup mode	下载启动模式/ Download startup mode
GPIO8	内部上拉/ The internal pull	无关项/NO	1
GPIO9	内部上拉/ The internal pull	1	0
系统启动过程中，控制 ROM Code 打印/ Control the ROM Code printing during system startup			
管脚/Pin	默认/Default	功能/Function	

GPIO8	无	eFuse 的 UART_PRINT_CONTROL 为 0 时，上电正常打印，不受 GPIO8 控制。 1 时，若 GPIO8 为 0，上电正常打印；若 GPIO8 为 1，上电不打印。 2 时，若 GPIO8 为 0，上电不打印；若 GPIO8 为 1，上电正常打印。 3 时，上电不打印，不受 GPIO8 控制。/ The UART _ PRINT _ CONTROL of the eFuse is At 0, the power-on is printed normally, not controlled by GPIO8. At 1, if GPIO8 is 0, print normally; if GPIO8 is 1, do not print. At 2, if GPIO8 is 0, do not print; if GPIO8 is 1, print normally. At 3, the power-on is not printed, not controlled by GPIO8.

Strapping 管脚的建立时间和保持时间的参数说明 (参考下图)/ Strapping Parameter description of the establishment time and holding time of the pipe pin (refer to the figure below)

参数/ Parameter	说明/ Explain	最小值/Min.
0	CHIP_EN 上电前的建立时间/ establishment time before CHIP_EN power up	0ms
1	CHIP_EN 上电后的保持时间/ Hold time after CHIP _ EN power	3ms

如图2 显示了 CHIP_EN 上电前和上电后 Strapping 管脚的建立时间和保持时间。

Figure 2 shows the establishment time and holding time of Strapping pins before and after power of CHIP _ EN.

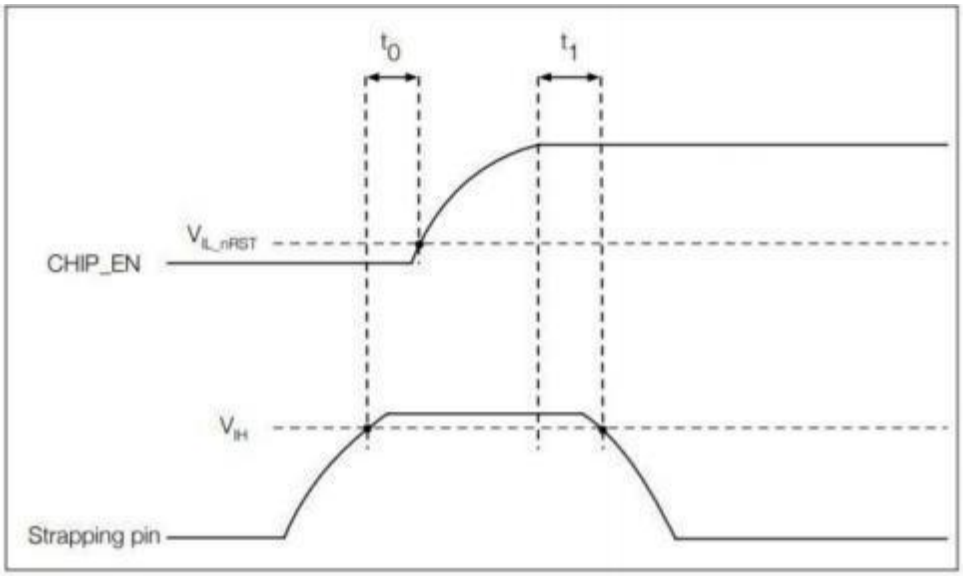


图 2 建立时间和保持时间/Figure 2: build time and hold time

说明：1.GPIO8=0 且 GPIO9=0 不可使用。

Description: 1. GPIO 8 = 0 and GPIO 9 = 0 is not usable.

5 电气特性/Electrical character

5.1 绝对最大额定值/Absolute maximum rating

超出绝对最大额定值可能导致器件永久性损坏。这只是强调的额定值，不涉及器件在这些或其 它 条件下超出本 技术规格指标的功能性操作。长时间暴露在绝对最大额定条件下可能会影响模组的可靠性。

Beyond the absolute maximum rating may cause permanent damage to the device. This only emphasizes the rating and does not involve the functional operation of the device under these or other conditions. Long exposure to absolute maximum rating conditions may affect module reliability.

5.2 建议工作条件/Recommended working conditions

表3 工作条件/Table 3 Working conditions

符号/Symbol	参数/ Parameter		最小值/Min	典型值/Typ	最大值/Max	单位/Unit
VDD	电源管脚电压/Power pipe foot voltage		3.0	3.3	3.6	V
IVDD	外部电源的供电电流/Supply current of the external power supply		0.5	-	-	A
TA	环境温度/Environment temperature	85℃版	-40	-	85	℃
		105℃版（定制/custom made）	-40	-	105	
Humidity	湿度/Humidity		-	-	85	%RH

5.3 功耗/Consumption

表4 射频功耗/ Table 4 RF power consumption

射频功耗/ RF power consumption			
	工作模式/Working model	描述/Describe	峰值/Peak value (mA)
Active(射频工作/RF work)	TX	802 11b, 1Mbps, @21dBm	370
		802.11g, 54Mbps, @19dBm	320

		802.11n, HT20, MCS 7, @18dBm	300
	RX	802.11b/g/n, HT20	65

说明：室温，3.3V 电源，TX continues 模式，DC 电源精度百微安级

Description: room temperature, 3.3V power supply, TX continues mode, DC power supply accuracy of 100 micro-ampere level

表 5 功耗模式/Table 5 Power consumption mode

功耗模式/Power consumption mode	**描述/Describe**		**典型值/Typical value**
Modem-sleep	80MHz	WFI (Wait-for-Interrupt)	9.4mA
		CPU 全速运转时/The CPU operates at full speed	12.1mA
	120MHz	WFI (Wait-for-Interrupt)	10.7mA
		CPU 全速运转时/The CPU operates at full speed	14.7mA
Light-sleep			140uA
Deep-sleep			5uA
Power off	EN 拉低/EN bring down		1uA

6.性能参数/Performance parameter

表6-1: 硬件特性参数/Table 6-1: Hardware characteristic parameters

硬件特性/ Hardware features	
模块/ Module	WG237
天线类型/Antenna type	板载天线/On-board antenna
电压/Voltage	3.3V+/-10%
尺寸(L×W×H)/ Dimensions (LWH)	24.0mm*16.0mm*3.1mm
其他/Other	
环境/Environment	工作温度/Operation temperature: -40℃~85℃ 存储温度/Storage temperature: -40℃~105℃

	工作湿度/Operation humidity: 10%~90% 不凝结/Noncondensing 存储湿度/Storage humidity: 5%~90% 不凝结/Noncondensing

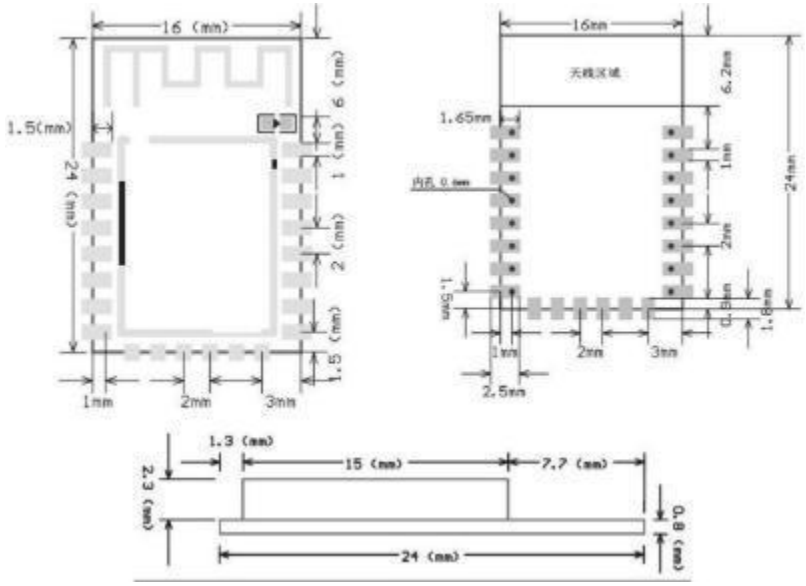
表6-2: WIFI特性参数/Table 6-2: WIFI Characteristic Parameters

2.4GHz WIFI 特性/2.4GHz WIFI feature	
无线标准/Wireless standards	IEEE 802.11 b/g/n/ax
频率范围/Frequency range	2.400-2.4835GHz
传输速率/ Transmission speed	IEEE 802.11b Standard Mode: 1,2,5.5,11Mbps
	IEEE 802.11g Standard Mode: 6,9,12,18,24,36,48,54Mbps
	IEEE 802.11ax Standard Mode: 72.2Mbps @ HT20(MCS7)
2.4G 接收灵敏度/2.4G reception sensitivity	IEEE 802.11b: -85dBm@ 8% PER
	IEEE 802.11g: -76dBm@10% PER
	IEEE 802.11n: -73dBm@10% PER(MCS7)
无线安全/Wireless security	Support of WEP, WPA, WPA2, WPA3 (Personal and Enterprise modes)
发射功率±2dBm/ Emission power of ± 2 dBm	IEEE 802.11b: 17dBm IEEE 802.11g: 14dBm IEEE 802.11n: 12-14dBm@HT20 MCS7
工作模式/Work pattern	Soft AP/ Station

表6-3: BLE特性参数/Table 6-3: BLE Characteristic Parameters

参数/ Parameter	条件/Condition	最小/Min	典型/Typ	最大/Max	单位/ Unit
工作频率/ Working frequency		2402		2480	MHz
传输速率/ Transmission speed				2	Mbps
发射功率/Transmitting power		-24	+9	+21	dbm
灵敏度 /Sensibility		-97	-100	-100	dBm

7 模组尺寸图/ Module size diagram



8 外围参考电路/ Peripheral reference circuit

模组与外围器件 (如电源、天线、复位按钮、JTAG 接口、UART 接口等) 连接的应用电路图。

Application circuit diagram connecting the module and peripheral devices (such as power supply, antenna, reset button, JTAG interface, UART interface, etc.).

GPIO9为烧录管脚，默认高电平，下拉进入烧录模式。

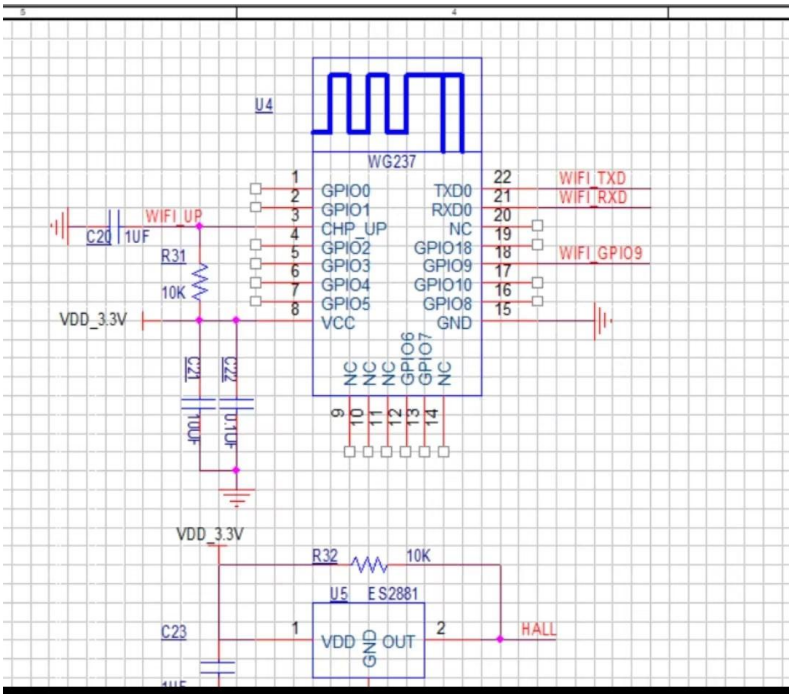


图 3 应用电路图/ Figure 3 Application circuit diagram

EPAD 可以不焊接到底板，但是焊接到底板的 GND 可以获得更好的散热特性。如果您想 将 EPAD 焊接到底板，请确保焊膏使用量正确。

EPAD can not weld the plate, but the GND of the plate can obtain better heat dissipation characteristics. If you want to weld the EPAD to the plate, make sure the paste is used correctly.

为确保WG237 模组上电时的供电正常，EN 管脚处需要增加 RC 延迟电路。RC 通常建议为R = 10 kΩ，C = 1 μF，但具体数值仍需根据模组电源的上电时序和模组的上电复位时 序进行调整。

To ensure the WG237 module, the RC delay circuit should be added at the EN pin. RC is usually recommended to be R = 10 kΩ and C = 1 μ F, but the specific value still needs to be adjusted according to the power switching timing of the module power supply and the power switching reset timing of the module.

9 生产过程推荐/ Production process recommendation

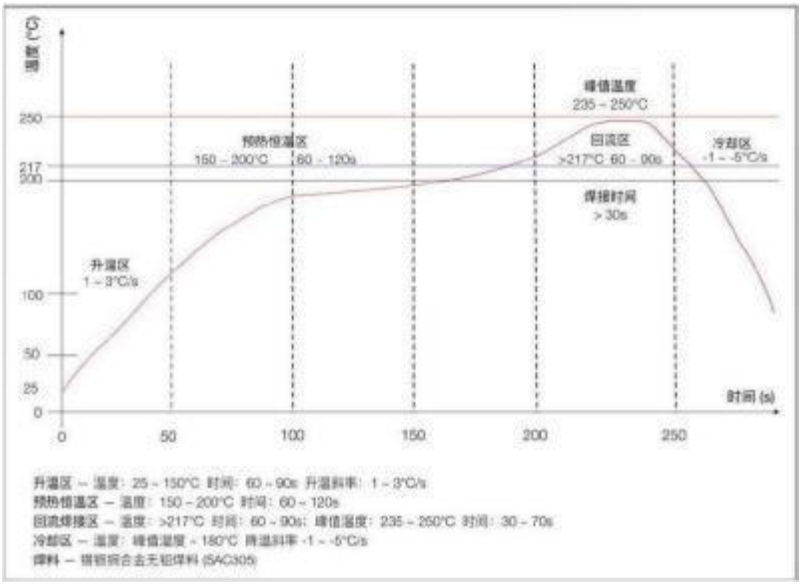


图5 回流焊标准温度/Figure 5 Standard temperature of reflux welding

升 温 区：温度：25~150℃；时间：60~90秒之间； 斜率控制在 1~3℃/S之间。

Heating area: temperature: 25~150℃; time: between 60~90 seconds; the slope is controlled between 1~3 ℃ / S.

预热恒温区：温度：150℃~200℃ ；时间：60- 120秒之间；

Preheated constant temperature zone: temperature: 150℃ ~200℃; time: between 60-120 seconds;

回流焊接区：温度：>217℃；时间：60~90秒之间；峰值温度 235℃~250℃，时间 30-70秒。

Return welding zone: temperature:> 217℃; time: between 60-90 seconds; peak temperature: 235℃ -250 ℃, time: 30-70 seconds.

冷 却 区： 温度：峰值温度~180℃；斜率在 -1~-5℃/S 之间。

Cooling zone: Temperature: peak temperature ~180℃; slope between-1 and-5℃ / S.

焊料：锡银铜合金无铅焊料。

Welder: tin silver copper alloy lead-free solder.

10 订购信息/Order information

型号/Model	FLASH	天线类型/Antenna type	Operation temperature
WG237-P	2M	板载天线/On-board antenna	-40℃-85℃
WG237-N4P	4M	板载天线/On-board antenna	-40℃-85℃

注：模块工作温范围可定制：-40℃-105℃

Note: The module operating temperature range can be customized: -40℃ -105℃

11 联系方式/Contact information

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