威尔健科技
WEIKENG

WK515 模组
规格书

版本：V1.0

2022/07/15

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修订历史

版本	修改内容	修订者	日期
V1.0	首次发布	罗佳顶	2022/07/15

目录

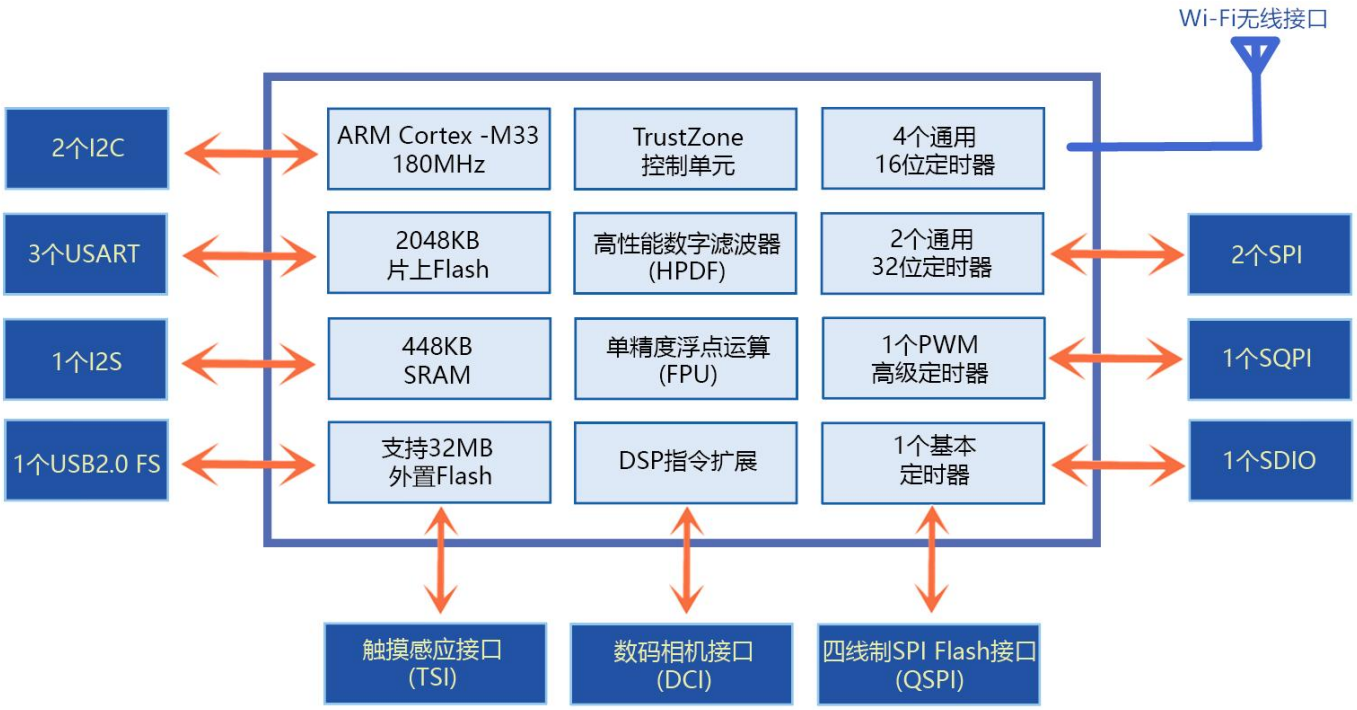
一、产品概述

WK515 贴片式模组是一款高度集成的 2.4GHz Wi-Fi 模组，该模组模块采用 GD32W515 芯片；该芯片内置一颗带有 Trustzone 的 ARM Cortex-M33 内核处理器，主频高达 180Mhz；它是一个优化的 SoC，为广泛的物联网（IoT）应用的智能设备而设计。

Cortex-M33 内核处理器是一款 32 位的处理器，基于 ARMv8 架构，具有低中断延迟和低成本调试；支持强大和可扩展的指令集，包括一般数据处理 I/O 控制任务、高级数据处理位域操作和 DSP；高度集成的特点使 Cortex-M33 内核处理器适用于需要高性能和低功耗的微控制器的市场产品。

WK515 贴片式模组适用于广泛的应用领域，特别是在工业控制、电机驱动、用户界面、电源监控和报警系统、消费和手持设备、游戏和 GPS、电动自行车、光模块等领域。

该芯片框图如下所示：



功能特点:

- Arm Cortex-M33 内核
  - 频率高达 180 MHz
  - 2.4GHz 单流 IEEE802.11b/g/n MAC/Baseband/RF 射频模块
  - DSP 指令扩展和单精度浮点运算(FPU)
  - TrustZone 硬件安全机制

- 存储器
  - 高达 2048KB 的片上 Flash
  - 高达 448KB 的 SRAM
  - 支持 32MB 的外置 Flash

- 射频性能
  - 最大发射功率为 21dBm
  - 信号接收灵敏度可达-97.6dBm
  - 邻道抑制(ACR)值高达 48dB
  - Iperf 吞吐量可达 50Mbps，屏蔽室内测试最高可达 80Mbps

- 高精度模拟外设
  - 1 个 12 位 ADC

- 集成外设接口
  - 2 个 SPI
  - 1 个 SQPI
  - 1 个 SDIO
  - 2 个 I2C
  - 3 个 USART
  - 1 个 I2S
  - 1 个 USB2.0 FS
  - Wi-Fi 无线接口

- 片上资源
  - 4 个通用 16 位定时器
  - 2 个通用 32 位定时器
  - 1 个基本定时器
  - 1 个 PWM 高级定时器
  - TrustZone 控制单元(TZPCU)
  - 数码相机接口(DCI)
  - 触摸感应接口(TSI)
  - 四线制 SPI Flash 接口(QSPI)
  - 高性能数字滤波器(HPDF)

二、电气参数

（一）、基本参数

1、Absolute Maximum Ratings

Symbol	Min.	Max.	Unit
VDD	-0.3	3.63	V
VDDA	-0.3	3.63	V
Storage Temperature	-65	+150	℃

2、Recommended Operating Conditions

Symbol	Symbol	Min.	Typ.	Max.	Unit
VDD	Supply voltage	2.7	3.3	3.63	V
VDDA	Analog Supply voltage	3.0	3.3	3.63	V
Operating Temperature	—	-40	—	85	℃

（二）、WiFi 射频参数

1、Supported Frequencies

Feature	Description
WLAN Standard	IEEE 802.11 b/g/n WiFi compliant
Frequency Range	2.400 GHz~ 2.4835GHz (2.4 GHz ISM Band)
Number of Channels	2.4GHz :Ch1~Ch14

2、WiFi Power consumption characteristics

Power Mode	MCU State	WiFi State
Active	Active	Active
WiFi Sleep	Active	Power save mode: Wi-Fi wake up periodically to listen beacon frame to stay connected to the AP
Mild Sleep	Power on, PLL off, Clock gated	Power save mode: Wi-Fi wake up periodically to listen beacon frame to stay connected to the AP
Hibernation	Mostly power off, only the wake up source is power on	Power off
Shutdown	—	Power off

3、WiFi Power consumption characteristics

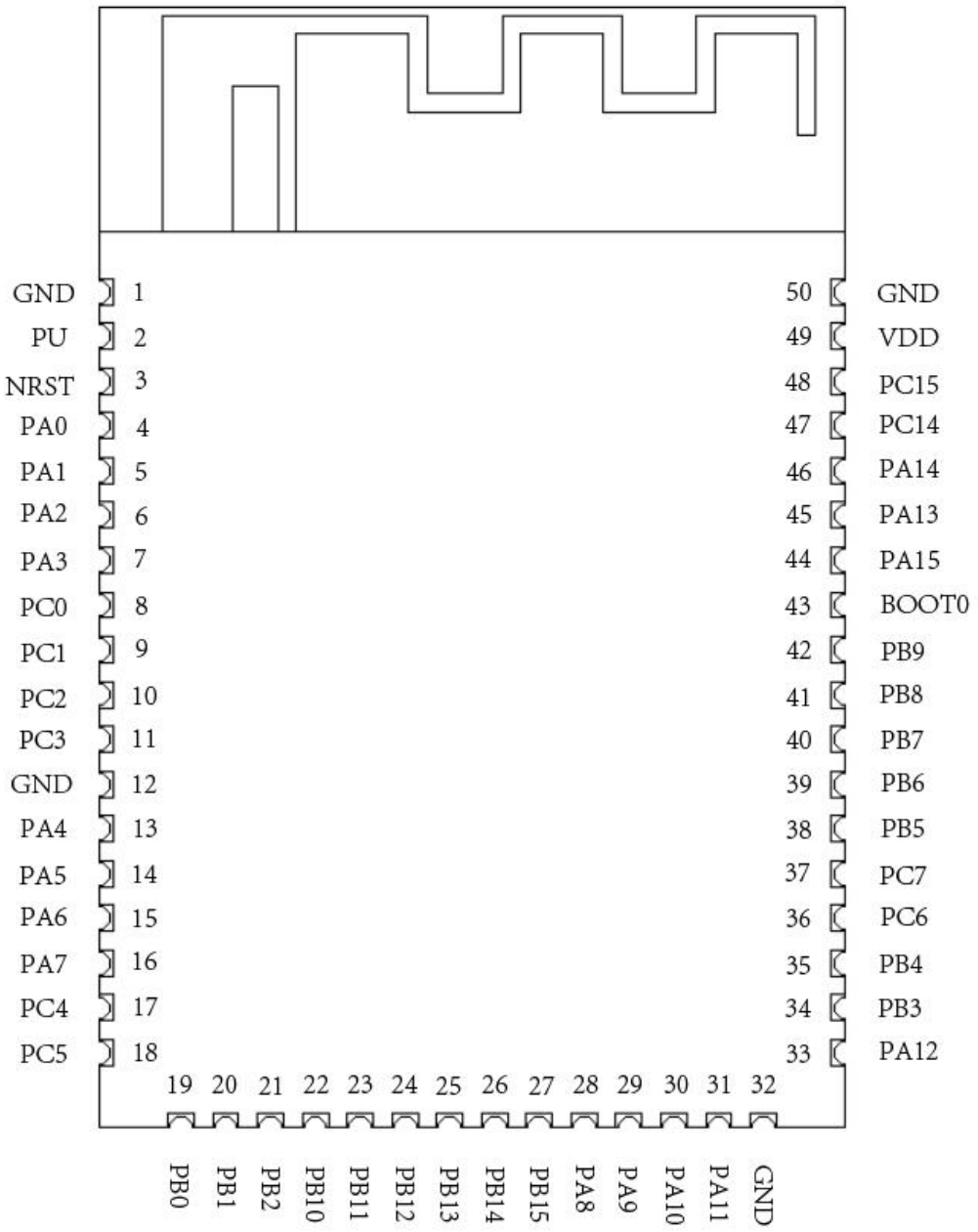
Power Mode	Description	Consumption	Unit
Active	WiFi Tx 802.11b, CCK 1Mbps, Pout = +18dBm	338	mA
	WiFi Tx 802.11b, CCK 11Mbps, Pout = +17dBm	323	mA
	WiFi Tx 802.11g, OFDM 6Mbps, Pout =+18dBm	327	mA
	WiFi Tx 802.11g, OFDM 54Mbps, Pout =+15dBm	289	mA
	WiFi Tx 802.11n, HT 20M MCS0, Pout =+16dBm	297	mA
	WiFi Tx 802.11n, HT 20M MCS7, Pout =+13dBm	272	mA
	WiFi Tx 802.11n, HT 40M MCS0, Pout =+14dBm	280	mA
	WiFi Tx 802.11n, HT 40M MCS7, Pout =+12dBm	267	mA
	WiFi Rx 802.11b, CCK 1Mbps, -90dBm	101	mA
	WiFi Rx 802.11b, CCK 11Mbps, -80Bm	102	mA
	WiFi Rx 802.11g, OFDM 6Mbps, -80dBm	120	mA
	WiFi Rx 802.11g, OFDM 54Mbps, -70dBm	126	mA
	WiFi Rx 802.11n, HT 20M MCS0, -75dBm	120	mA
	WiFi Rx 802.11n, HT 20M MCS7, -65dBm	126	mA
	WiFi Rx 802.11n, HT 40M MCS0, -72dBm	124	mA
	WiFi Rx 802.11n, HT 40M MCS7, -62dBm	129	mA
Wi-Fi Sleep	MCU in Run mode	56.5	mA
Mild Sleep	DTIM=1	1.5	mA
	DTIM=3	0.75	mA
Hibernation	MCU in Standby mode	5.4	μA
Shutdown	—	—	mA

三、WK515-D0-A 模组

（一）、模组介绍

WK515-D0-A 模组为单 WiFi 模组，封装为 SMD-50（表面贴装器件），模组本身自带 2 MB 的 FLASH，用户也可以根据自身要求选配外置 FLASH，该模组为双天线模式，具有板载天线和 Ipex 端子接口，用户可以根据自身要求选择天线类型；

（二）、管脚定义



序号	管脚名称	管脚类型	功能说明
1	GND	POWER	Default: GND Ground connections
2	PU	I	Default: PU
3	NRST	I/O	Default: NRST
4	PA0	I/O	Default: PA0 Alternate: USART0_TX, TSI_G0_IO0, USART1_CTS, EVENTOUT, TIMER1_CH0, TIMER1_ETI, TIMER4_CH0 Additional: ADC_IN0
5	PA1	I/O	Default: PA1 Alternate: USART0_RX, TSI_G0_IO1, USART1_RTS, EVENTOUT, TIMER1_CH1, TIMER4_CH1 Additional: ADC_IN1
6	PA2	I/O	Default: PA2 Alternate: USART0_CK, TSI_G0_IO2, TIMER0_CH0, EVENTOUT, TIMER1_CH2, TIMER4_CH2, I2S1_CKIN, USART1_TX, HPDF_AUDIO Additional: ADC_IN2, WKUP0, RTC_TAMP1
7	PA3	I/O	Default: PA3 Alternate: USART1_CK, TSI_G0_IO3, TIMER0_CH0_ON, HPDF_DATA IN1, EVENTOUT, TIMER1_CH3, TIMER4_CH3, I2S1_MCK, USART1_RX, RTC_OUT Additional: ADC_IN3
8	PC0	I/O	Default: PC0 Alternate: USART1_TX, TIMER0_CH3, I2C0_SMBA, HPDF_CKIN0, EVENTOUT, DCI_D4 Additional: ADC_IN4
9	PC1	I/O	Default: PC1 Alternate: I2S1_SD, USART1_RX, DCI_HSY NC, TIMER0_BRKIN, I2C1_SMBA, HPDF_CKIN1, EVENTOUT, SPI1_MOSI, DCI_D8 Additional: ADC_IN5
10	PC2	I/O	Default: PC2 Alternate: HPDF_CKOUT, I2C1_SDA, I2C0_SCL,TIMER4_CH0, TIMER0_CH0, DCI_VSYNC, TIMER0_ETI, EVENTOUT, SPI1_MISO, I2S1_ADD_SD, DCI_D9 Additional: ADC_IN6

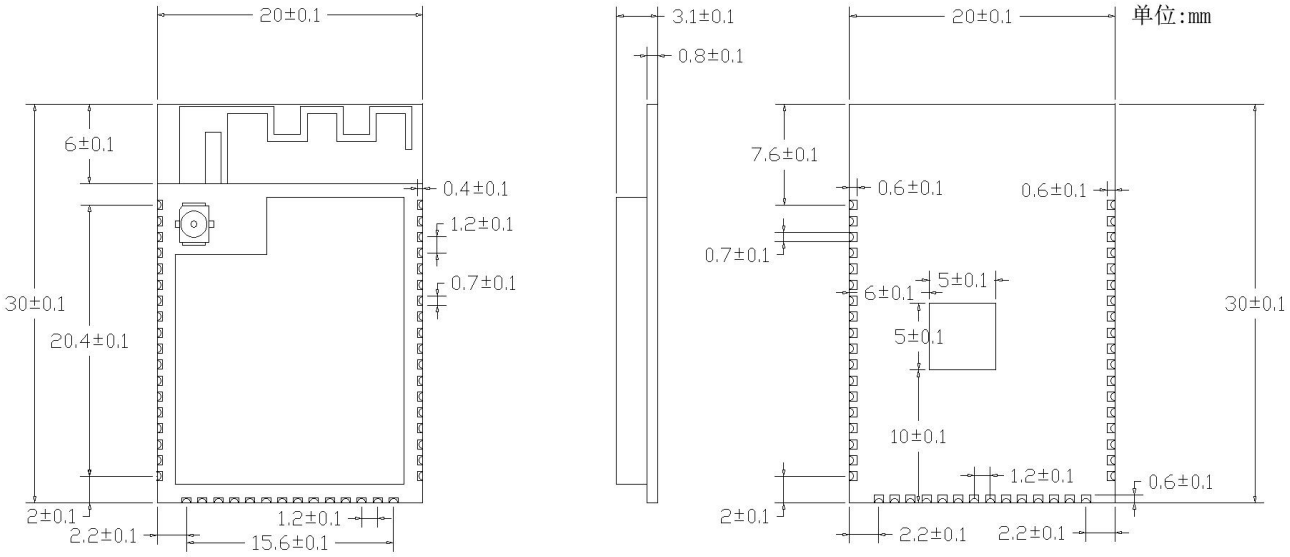
序号	管脚名称	管脚类型	功能说明
11	PC3	I/O	Default: PC3 Alternate: I2S1_SD, HPDF_DATA IN0, I2C1_SCL, I2C0_SDA, TIMER4_CH1, TIMER0_CH0_ON, DCI_PIXCLK, TIMER1_CH0, TIMER1_ETI, EVENTOUT, SPI1_MOSI, DCI_D11 Additional: ADC_IN7
12	GND	POWER	Default: GND Ground connections
13	PA4	I/O	Default: PA4 Alternate: I2S1_ADD_SD, SPI1_MOSI, I2S1_SD, SPI0_MOSI, QSPI_SCK, TIMER4_CH2, DCI_HSYNC, USART1_TX, TIMER0_CH1, EVENTOUT, SPI0_NSS, USART1_CK Additional: ADC_IN8
14	PA5	I/O	Default: PA5 Alternate: I2S1_MCK, SPI0_MISO, QSPI_CSN, TIMER4_CH3, DCI_VSYNC, USART1_RX, TIMER0_CH1_ON, EVENTOUT, SPI0_SCK
15	PA6	I/O	Default: PA6 Alternate: I2S1_CKIN, SPI0_SCK, QSPI_IO0, TIMER2_CH0, DCI_PIXCLK, USART2_TX, TIMER0_CH1, TIMER1_CH1, EVENTOUT, SPI0_MISO, I2S1_MCK, SDIO_CMD, HPDF_A UDIO
16	PA7	I/O	Default: PA7 Alternate: SPI1_NSS, I2S1_WS, SPI0_NSS, QSPI_IO1, TIMER2_CH1, DCI_D7, USART2_RX, TIMER0_CH1_ON, TIMER1_CH2, EVENTOUT, TIMER0_CH0_ON, SPI0_MOSI
17	PC4	I/O	Default: PC4 Alternate: I2S1_ADD_SD, SPI0_IO2, QSPI_IO2, TIMER2_CH2, DCI_D6, EVENTOUT, SQPI_CLK, DCI_D12
18	PC5	I/O	Default: PC5 Alternate: CK_OUT1, SPI0_IO3, QSPI_IO3, TIMER2_CH3, TIMER2_CH0, DCI_D5, DCI_D7, EVENTOUT, USART2_RX, SQPI_CSN, DCI_D13
19	PB0	I/O	Default: PB0 Alternate: TSI_G1_IO0, TIMER3_CH0, TIMER2_CH1, DCI_D4, DCI_D6, EVENTOUT, TIMER0_CH1_ON,SDIO_D1

序号	管脚名称	管脚类型	功能说明
20	PB1	I/O	Default: PB1 Alternate: TSI_G1_IO1, TIMER3_CH1, TIMER2_CH2, DCI_D3, DCI_D5, EVENTOUT, TIMER0_CH2_ON, SDIO_D2
21	PB2	I/O	Default: PB2 Alternate: TSI_G1_IO2, TIMER3_CH2, TIMER2_CH3, DCI_D2, DCI_D4, EVENTOUT, TIMER1_CH3, SDIO_CK Additional: WKUP2
22	PB10	I/O	Default: PB10 Alternate: TSI_G1_IO3, TIMER3_CH3, TIMER0_CH1, DCI_D1, DCI_D3, IFRP_OUT, EVENTOUT, TIMER1_CH2, TIMER3_ETI, USART2_TX, SDIO_D7
23	PB11	I/O	Default: PB11 Alternate: USBFS_ID, TSI_G2_IO0, TIMER0_CH1_ON, DCI_D0, DCI_D2, EVENTOUT, I2S1_CKIN, USART2_RX, SDIO_D6
24	PB12	I/O	Default: PB12 Alternate: I2S1_WS, USBFS_DP, TSI_G2_IO1, DCI_D1, TIMER0_CH3, EVENTOUT, TIMER0_BRKIN, SPI1_NSS, USART2_CK
25	PB13	I/O	Default: PB13 Alternate: USBFS_DM, TSI_G2_IO2, DCI_D0, EVENTOUT, TIMER15_CH0, TIMER0_CH0_ON, SPI1_SCK, I2S1_CK, USART2_CTS
26	PB14	I/O	Default: PB14 Alternate: TSI_G2_IO3, EVENTOUT, TIMER15_BRKIN, TIMER0_CH1_ON, SPI1_MISO, I2S1_ADD_SD, USART2_RTS Additional: USBFS_VBUS
27	PB15	I/O	Default: PB15 Alternate: I2S1_SD, USART1_TX, USART0_TX, I2C0_SCL, I2C1_SCL, IFRP_OUT, EVENTOUT, RTC_REFIN, TIMER0_CH2_ON, SPI1_MOSI
28	PA8	I/O	Default: PA8 Alternate: CK_OUT0, USART1_RX, USART0_RX, I2C0_SDA, I2C1_SDA, EVENTOUT, TIMER15_CH0, TIMER0_CH0, USART0_CK, USBFS_SOF, SDIO_D1, RTC_OUT

序号	管脚名称	管脚类型	功能说明
29	PA9	I/O	Default: PA9 Alternate: SPI0_MOSI, SDIO_CMD, SQPI_CLK,QSPI_SCK, EVENTOUT, TIMER15_CH0_ON, TIMER0_CH1, SPI1_SCK, I2S1_CK, USART0_TX, SDIO_D2, DCI_D0
30	PA10	I/O	Default: PA10 Alternate: SPI0_MISO, SDIO_D0, SQPI_CSN, QSPI_CSN, EVENTOUT, TIMER16_CH0, TIMER0_CH2, DCI_D1
31	PA11	I/O	Default: PA11 Alternate: SPI0_SCK, SDIO_CK, SQPI_D0, QSPI_IO0, EVENTOUT, TIMER16_BRKIN, TIMER0_CH3, DCI_D2
32	GND	POWER	Default: GND Ground connections
33	PA12	I/O	Default: PA12 Alternate: SPI0_NSS, SDIO_D1, SQPI_D1, QSPI_IO1, EVENTOUT, TIMER16_CH0_ON, TIMER0_ETI, USART0_RTS, DCI_D3 Additional: WKUP3
34	PB3	I/O	Default: JTDO, TRACESWO, PB3 Alternate: USART2_CTS, SPI0_IO2, SDIO_D2, SQPI_D2, QSPI_IO2, EVENTOUT, TIMER15_BRKIN, TIMER1_CH1, SPI0_SCK, USART0_RX
35	PB4	I/O	Default: NJTRST, PB4 Alternate: USART2_RTS, SPI0_IO3, SDIO_D3, SQPI_D3, QSPI_IO3, TIMER1_CH0, TIMER1_ETI, EVENTOUT, SPI0_MISO
36	PC6	I/O	Default: PC6 Alternate: USART2_TX, TIMER1_CH1, TIMER0_CH1, TIMER0_BRKIN, TRACECK, TIMER16_BRKIN, TIMER2_CH0, I2S1_MCK, SDIO_D6, DCI_D0
37	PC7	I/O	Default: PC7 Alternate: USART2_RX, TIMER1_CH2, TIMER0_CH1_ON, TIMER0_ETI, TIMER16_CH0, TIMER2_CH1, SPI1_SCK, I2S1_CK, SDIO_D7, DCI_D1
38	PB5	I/O	Default: PB5 Alternate: USART2_CK, TIMER1_CH3, IFRP_OUT, EVENTOUT, TSITG, SPI0_MOSI, DCI_D10
39	PB6	I/O	Default: PB6 Alternate: SPI1_MISO, EVENTOUT, TRACED0, DCI_D5

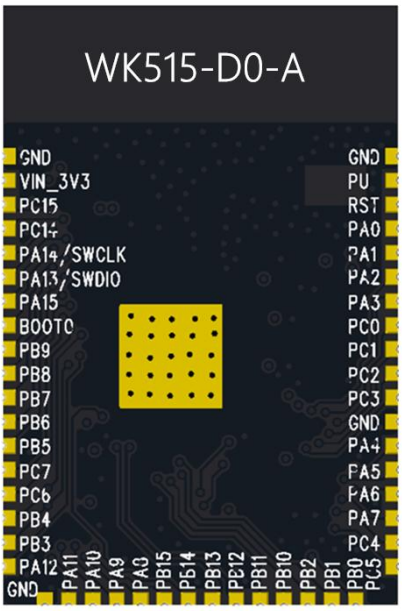
序号	管脚名称	管脚类型	功能说明
40	PB7	I/O	Default: PB7 Alternate: I2S1_WS, SPI1_NSS, EVENTOUT, TRACED1, TIMER3_CH1, I2C0_SDA, USART0_RX, DCI_VSYNC
41	PB8	I/O	Default: PB8 Alternate: SPI1_SCK, I2S1_CK, EVENTOUT, TRACED2, TIMER3_CH2, SDIO_D4, DCI_D6
42	PB9	I/O	Default: PB9 Alternate: I2S1_SD, SPI1_MOSI, EVENTOUT, TRACED3, TIMER1_CH1, TIMER3_CH3, SDIO_D5, DCI_D7
43	PC8	I/O	Default: PC8 Alternate: I2C0_SDA, USART0_TX, I2C1_SDA, EVENTOUT, TIMER2_CH2, SDIO_D0, DCI_D2 Additional: BOOT0
44	PA15	I/O	Default: JTDI, PA15 Alternate: I2C0_SCL, USART0_RX, I2C1_SCL, EVENTOUT, SPI0_NSS Additional: WKUP1
45	PA13	I/O	Default: JTMS, SWDIO, PA13 Alternate: USART0_CTS, USART1_CTS, I2C0_SMBA, EVENTOUT, TSITG
46	PA14	I/O	Default: JTCK, SWCLK, PA14 Alternate: USART0_RTS, USART1_RTS, I2C1_SMBA, EVENTOUT Additional: BOOT1
47	PC14	I/O	Default: PC14 Alternate: USART0_CK, USART1_CK, EVENTOUT Additional: OSC32IN
48	PC15	I/O	Default: PC15 Alternate: IFRP_OUT, EVENTOUT Additional: RTC_TAMP0, RTC_OUT, RTC_TS, OSC32OUT
49	VDD	POWER	Default: VDD
50	GND	POWER	Default: GND Ground connections

（三）、尺寸大小



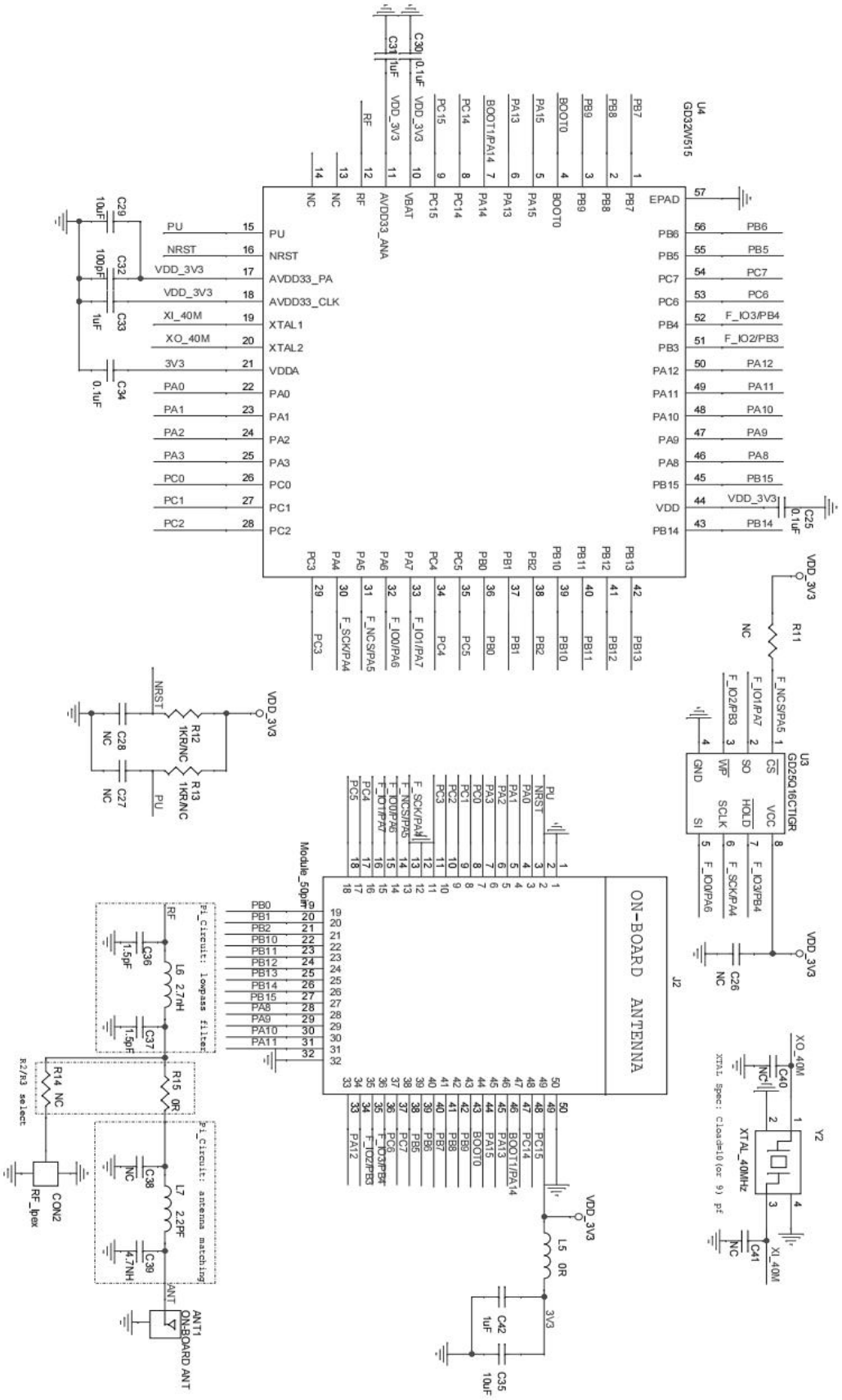
Top View　　Side View　　Bottom View

正面

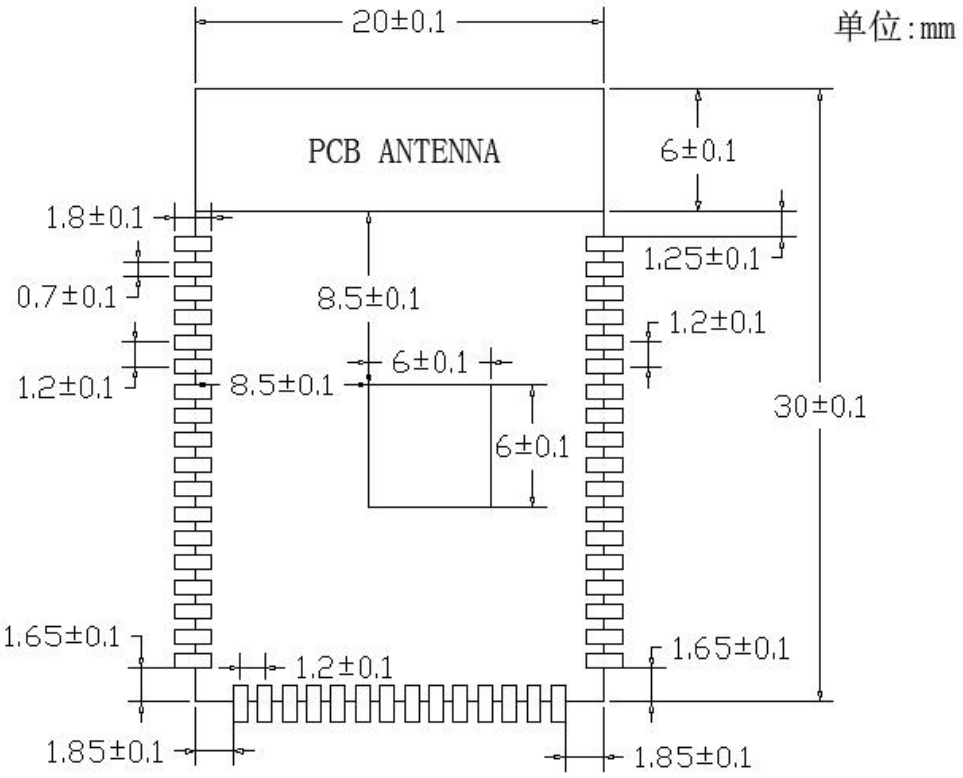


背面

（四）、模组原理图

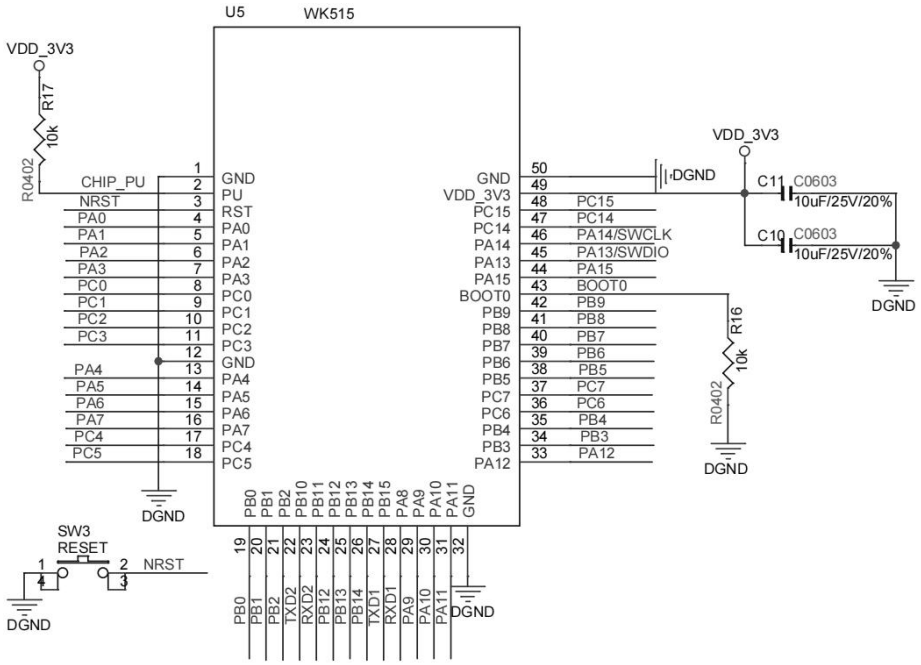


（五）、模组 PCB 封装尺寸



（六）、设计指导

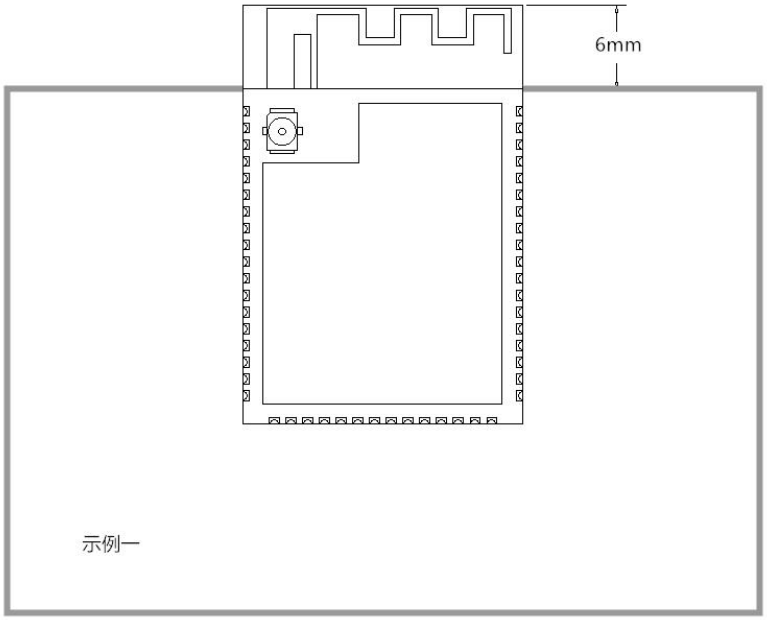
1. 模块应用参考电路



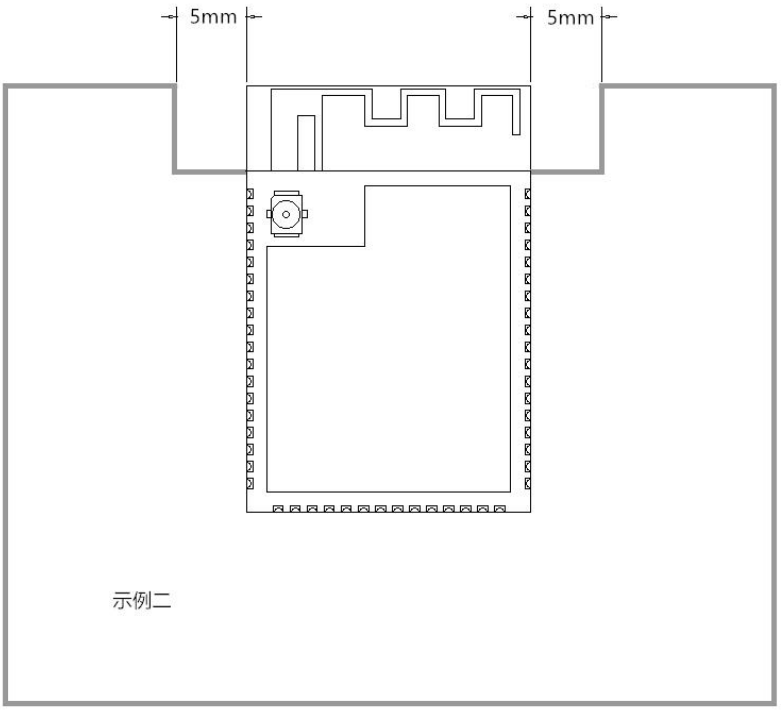
2.板载天线摆放要求

为了满足板载天线的性能，禁止在天线周边放置金属件和高频器件，天线摆放推荐下图两种示例摆放：

示例一：

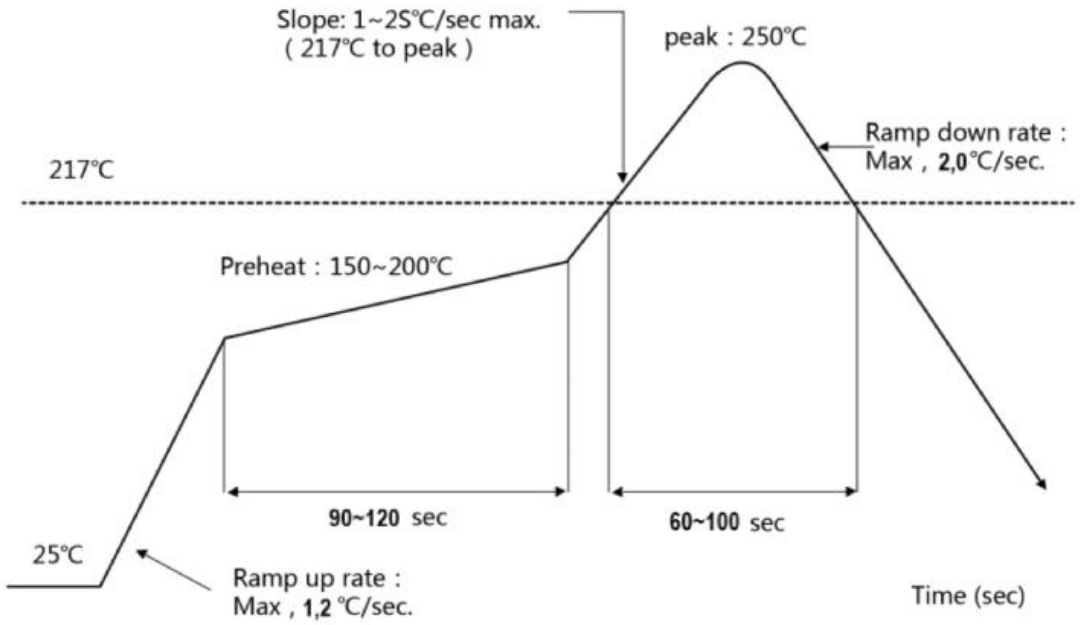


示例二



四、回流焊曲线图

1．参照 IPC/JEDEC 标准。
2. 峰值温度 ：< 250°C。
3. 次数 ：< 2 次。



五、联系我们

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六、参考资料

1.《GD32W515xx_Datasheet_Rev1.0.pdf》

