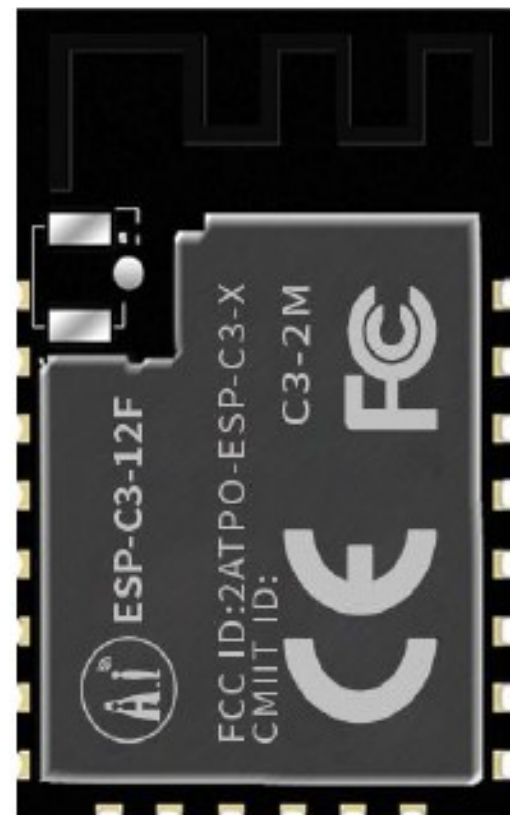


## ESP WIFI MODULE

### Features

- Complete Wi-Fi 802.11b/g/n, 1T1R mode data rate up to 150Mbps
- Support BLE5.0 and rate support: 125Kbps, 500Kbps, 1Mbps,2Mbps
- 32-bit RISC-V single-core processor, supports a clock frequency of up to 160 MHz with 400 KB SRAM, 384 KB ROM, 8KB RTC SRAM
- Support UART/PWM/GPIO/ADC/I2C/I2S interface, temperature sensor, pulse counter
- SMD-22 package
- Support multiple sleep modes, deep sleep electric current is less than 5uA
- UART rate up to 5Mbps
- Support STA/AP/STA+AP mode and mix mode
- Support Smart Config (APP)/AirKiss (WeChat) of Android and IOS One-click network configuration
- Support UART port local upgrade and remote firmware upgrade (FOTA)
- General AT commands can be better understand
- Support secondary development, integrated Linux development environment
- About Flash configuration—Acquiesce in using the built-in 4MByte Flash.



### Product Overview

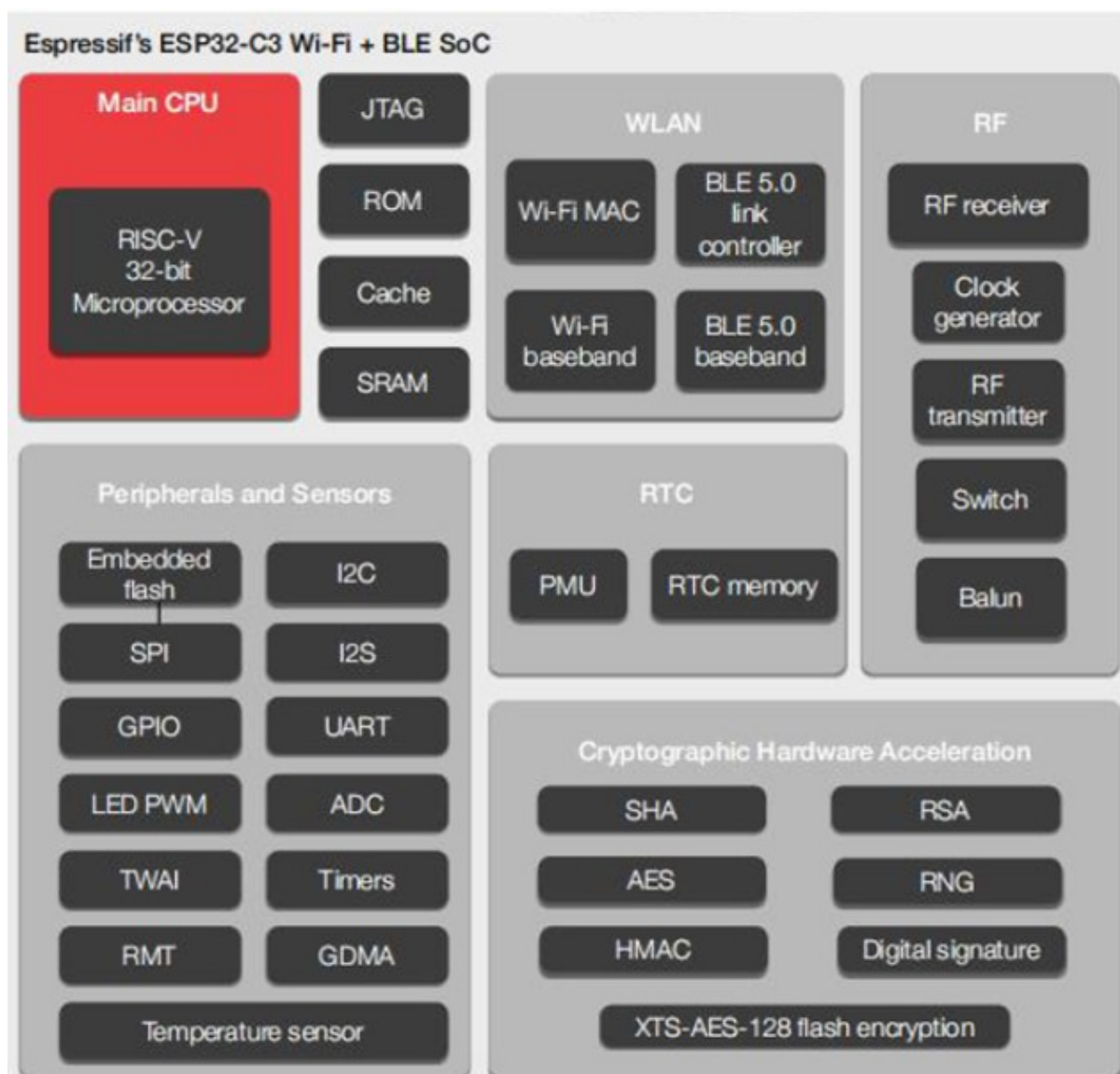
This module core processor ESP32-C3 is a Wi-Fi+ BLE combination of system-level chips (SoC), designed for various applications such as internet of things (IoT), mobile devices, wearable electronics, smart home, etc. ESP32-C3 with industry-leading low power and RF performance, supporting Wi-Fi IEEE802.11b/g/n agreements and BLE 5.0. ESP32-C3 chip is equipped with 32-bit RISC-V single-core processor, operating frequency up to 160 MHz. The chip is support to have secondary development without using other microcontrollers or processors.

The chip has a built-in 400 KB SRAM, 384 KB ROM, 8KB RTC SRAM. Also, the chip supports external Flash while it has built-in 4Mbit Flash. ESP32-C3 chip supports a variety of low-power consumption working states, which can meet the power consumption requirements of various application scenarios. The chip's unique features such as fine clock gating function, dynamic voltage clock frequency adjustment function, and RF output power adjustable function can achieve the best balance between communication distance, communication speed and power consumption.

ESP-C3-12F provides a wealth of peripheral interfaces, including UART, PWM, SPI, I2S, I2C, ADC, temperature sensor and there are 15 GPIOs.

ESP-C3-12F has a variety of unique hardware safety mechanisms. The hardware encryption accelerator supports AES, SHA and RSA algorithm. Among them, RNG, HMAC and Digital Signature modules provide more security features. Other security features include flash encryption and secure boot signature verification, etc. The perfect security mechanism enables the chip to be perfectly applied to various encryption products.

ESP-C3-12F module supports low-power Bluetooth: Bluetooth5 and Bluetooth mesh. Bluetooth rate support: 125Kbps, 500Kbps, 1Mbps, 2Mbps. Support broadcast extension, multi-broadcasting, channel selection.



## 1.2 Main Parameters

Table 1 Main Parameter Descriptions

<b>Model Name</b>	ESP-C3-12F
<b>Package</b>	SMD-22
<b>Size</b>	24.0*16.0*3.1(±0.2)mm
<b>Antenna</b>	On-board PCB antenna/IPEX
<b>Frequency Range</b>	2400 ~ 2483.5MHz
<b>Operating Temperature</b>	-40 °C ~ 85 °C
<b>Store Temperature</b>	-40 °C ~ 125 °C , < 90%RH
<b>Power supply range</b>	Voltage 3.0V ~ 3.6V, Electrical current >500mA
<b>Support Interface</b>	UART/GPIO/ADC/PWM/I2C/I2S
<b>IO</b>	IO0,IO1,IO2,IO3,IO4,IO5,IO6,IO7,IO8,IO9,IO10,IO18,IO19, IO20,IO21
<b>UART Rate</b>	Support 110 ~ 4608000 bps , default 115200 bps
<b>Bluetooth</b>	BLE 5.0
<b>Security</b>	WEP/WPA-PSK/WPA2-PSK
<b>SPI Flash</b>	Default allocation 4MByte, support 2MByte version

## 2 Electrical Parameters

ESP-C3-12F module is electrostatic sensitive devices and special precautions need to be taken when handling



## 2.1 Electrical Characteristics

Parameters	Conditions	Min	Typical values	Max	Unit	
Supply voltage	VDD	3.0	3.3	3.6	V	
I/O	$V_{IL}/V_{IH}$	-	-0.3/0.75VDD	-	0.25VDD/VDD+0.3	V
	$V_{OL}/V_{OH}$	-	N/0.8VIO	-	0.1VIO/N	V
	$I_{MAX}$	-	-	-	12	mA

## 2.2 WIFI RF Performance

Description	Typical values	Unit
Operating frequency	2400 - 2483.5	MHz
<b>Output Power</b>		
11n mode HT40, PA output power	15±2	dBm
11n mode HT20, PA output power	15±2	dBm
11g mode, PA output power	16±2	dBm
11b mode, PA output power	18±2	dBm
<b>Receiving sensitivity</b>		
CCK, 1 Mbps	-96±2	dBm
CCK, 11 Mbps	-88±2	dBm
6 Mbps (1/2 BPSK)	-92±2	dBm
54 Mbps (3/4 64-QAM)	-75±2	dBm
HT20 (MCS7)	-73±2	dBm
HT40 (MCS7)	-70±2	dBm

## 2.3 BLE RF Performance

Description	Typical values	Unit
<b>Output power</b>		
Transmit power	0±2	dBm
<b>Receiving sensitivity Low Energy consumption BLE: 1M</b>		
Sensitivity@30.8%PER	-96±2	dBm

## 2.4 Power Consumption

The following power consumption data are based on a 3.3 V power supply, 25°C ambient temperature and measured using an internal voltage regulator.

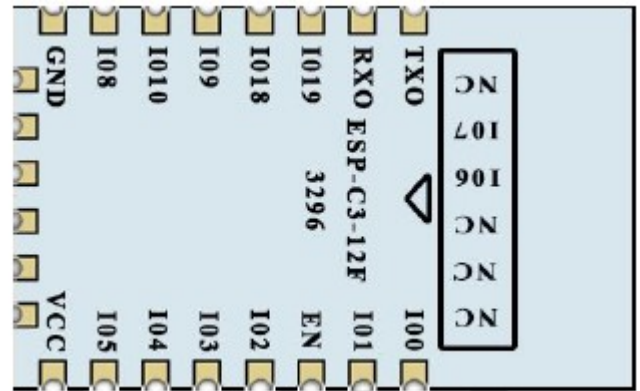
- All measurements were completed at the antenna interface without SAW filters
- All emission data are based on a duty cycle of 100%, measured in the mode of continuous emission.

Mode	Mix	Typical values	Max	Unit
Tx 802.11b, CCK 1Mbps, POUT=+20dBm	-	345	-	mA
Tx 802.11g, OFDM 54Mbps, POUT =+18dBm	-	285	-	mA
Tx 802.11n, MCS7, POUT =+17dBm	-	280	-	mA
Rx 802.11b,1024 bit	-	82	-	mA
Rx 802.11g,1024 bit	-	82	-	mA
Rx 802.11n,1024 bit	-	84	-	mA
Modem-Sleep <sup>①</sup>	-	20	-	mA
Light-Sleep <sup>②</sup>	-	130	-	µA
Deep-Sleep <sup>③</sup>	-	5	-	µA
Power Off	-	1	-	µA

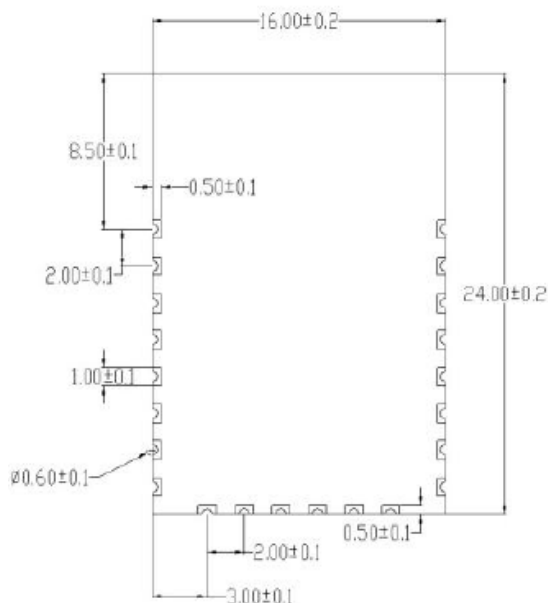
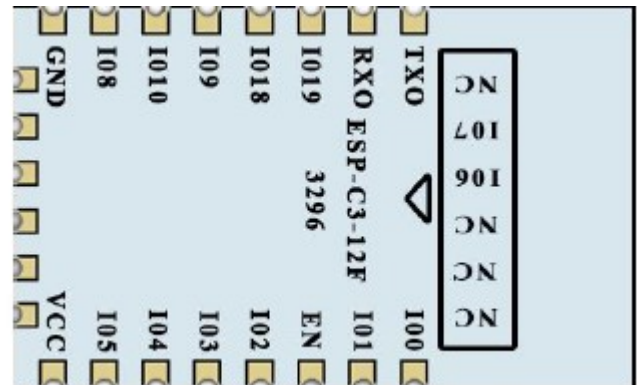
## 3 Appearance Dimensions

ESP-C3-12F have two FLASH, including external FLASH and build-in FLASH  
(The rendering is for reference only, the actual product shall prevail)

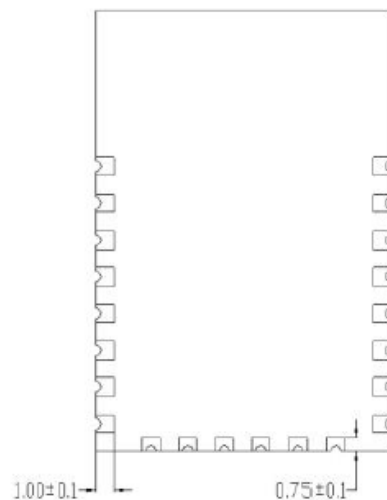
### External 2MByte FLASH:



### Build-in 4MByte FLASH:

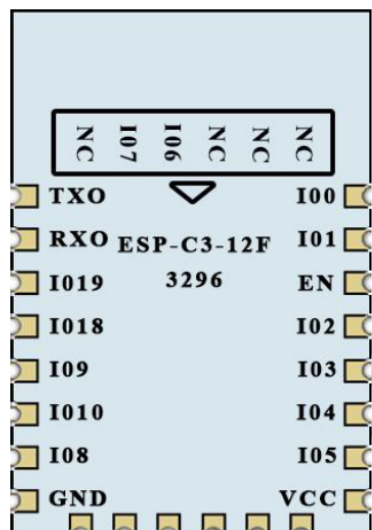


正面



背面

## 4 Pin Definition



ESP-C3-12F Diagram of Pin

ESP-C3-12F module is connected to 22 interfaces, refer to pin diagram, pin function definition table is interface definition.

Table ESP-C3-12F Pin function definition

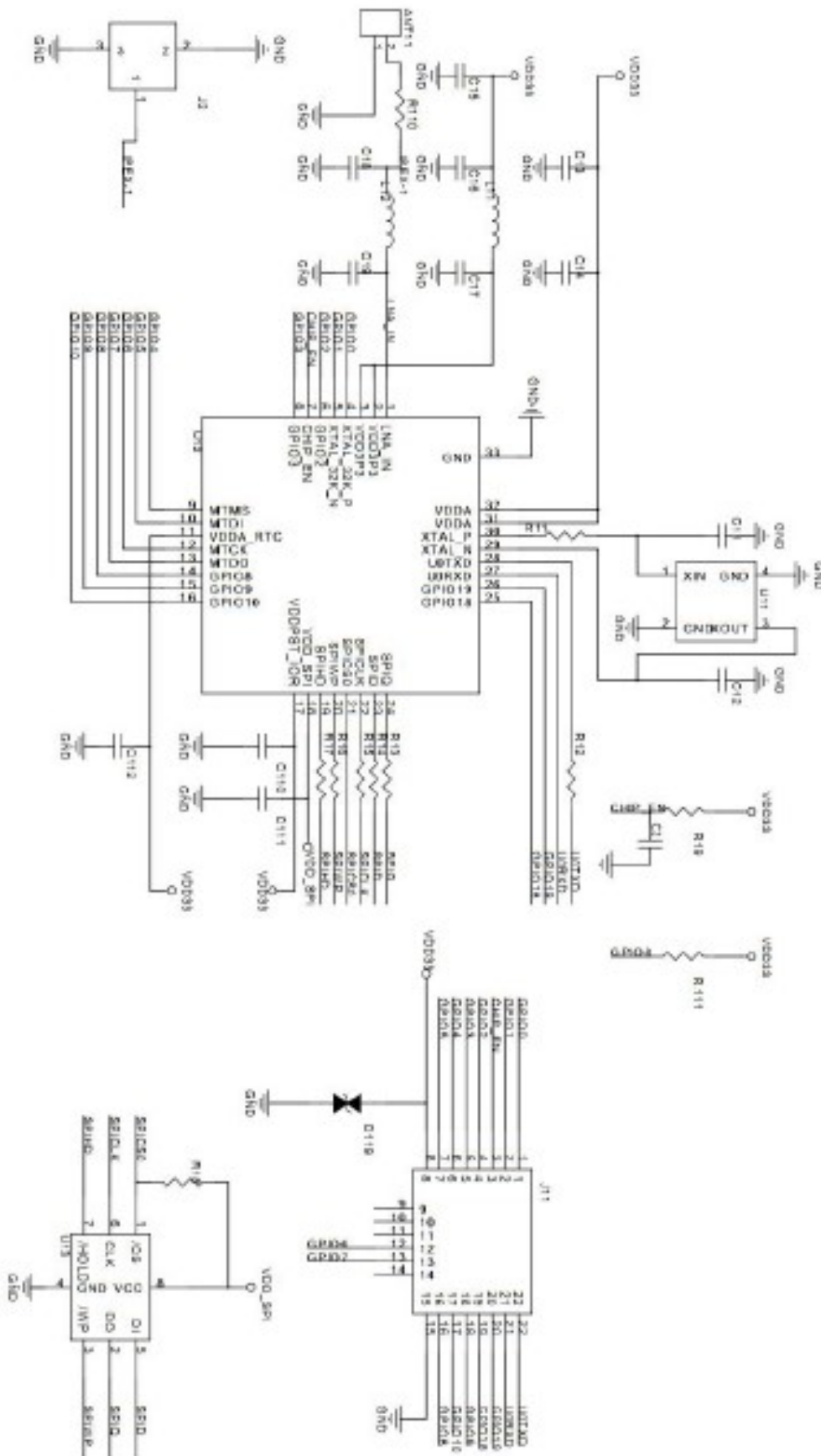
No.	Name	Function
1	IO0	GPIO0,ADC1_CH0,XTAL_32K_N
2	IO1	GPIO1,ADC1_CH1,XTAL_32K_N
3	EN	High level: chip enabled; Low level: chip shutdown; Pay attention not to leave the CHIP_PU pin floating:
4	IO2	GPIO2,ADC1_CH2,FSPIQ
5	IO3	GPIO03,ADC1_CH3
6	IO4	GPIO04,ADC1_CH4,FSPIHD,MTMS
7	IO5	GPIO05,ADC2_CH0,FSPIWP,MTDI
8	VCC	VCC
9	NC	NC
10	NC	NC
11	NC	NC
12	IO6	GPIO6,FSPICLK,MTCK
13	IO7	GPIO7,FSPID,MTDO
14	NC	NC
15	GND	GND
16	IO8	GPIO8
17	IO10	GPIO10,FSPICSO
18	IO9	GPIO9
19	IO18	GPIO18
20	IO19	GPIO19
21	RX	UART0_RX,GPIO20
22	TX	UART0_TX,GPIO21

Table Module Start-up Mode Description

System start-up mode			
Pin	Default	SPI Start up mode	Download Start up Mode
IO8	non	/	1
IO9	Pull up	1	0

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

## 5 Schematic Diagrams





## 6 Design Guidance

### 6.1. Note:

(1) When GPIO20 is used as U1RXD, a pull-up resistor needs to be added externally.

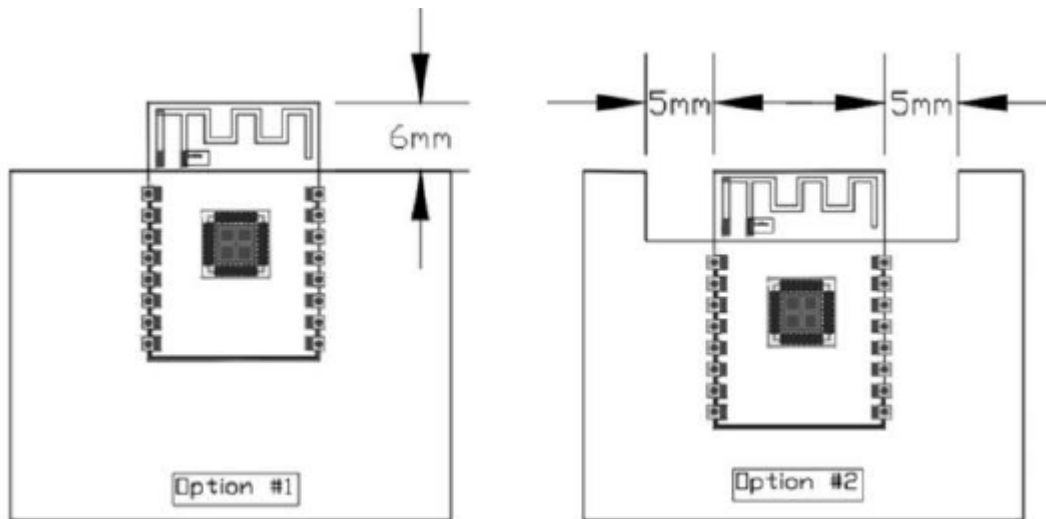
### 6.2. Antenna layout requirements

(1) For the installation position on the motherboard, the following two methods are recommended:

Solution 1: Put the module on the edge of the main board, and the antenna area extends out of the edge of the main board.

Solution 2: Put the module on the edge of the main board, and hollow out an area at the antenna position on the edge of the main board.

(2) In order to meet the performance of the on-board antenna, metal parts are forbidden to be placed around the antenna, away from high frequency devices.



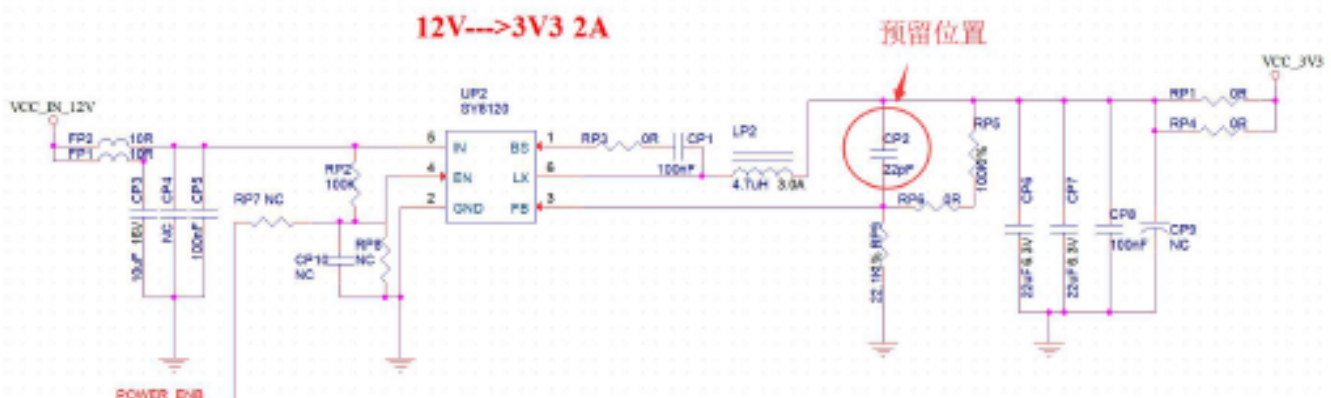
### 6.3. Power supply

(1) Recommend 3.3V voltage, peak current above 500mA

(2) It is recommended to use LDO for power supply; if DC-DC is used, the ripple is recommended to be controlled within 30mV.

(3) DC-DC the power supply circuit, it is suggested to reserve the position of output ripple can be optimized when the load changes greatly.

(4) It is recommended to add ESD devices to the 3.3V power interface.



## 6.4. GPIO Interface

(1) The module periphery leads to some GPIO ports, such as the recommended resistance of 10-100 Ohms in series on the IO port. This can suppress overshoot, to ensure both sides of the level more stable. helpful for both EMI and ESD.

(2) For special IO, please refer to the specification, which will affect the starting configuration of the module.

(3) The IO port of the module voltage is 3.3 V, if the main control does not match the IO level of the module, require to add the level conversion circuit.

(4) When the IO port is connected directly to the peripheral interface, or the pin header and other terminals, it is recommended to reserve ESD device near the terminal.

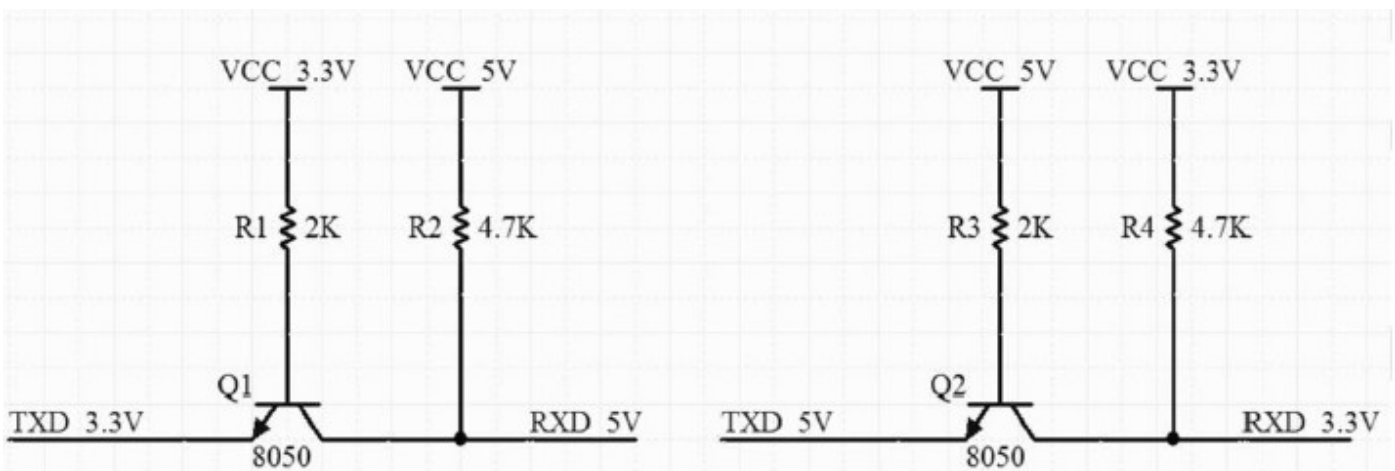
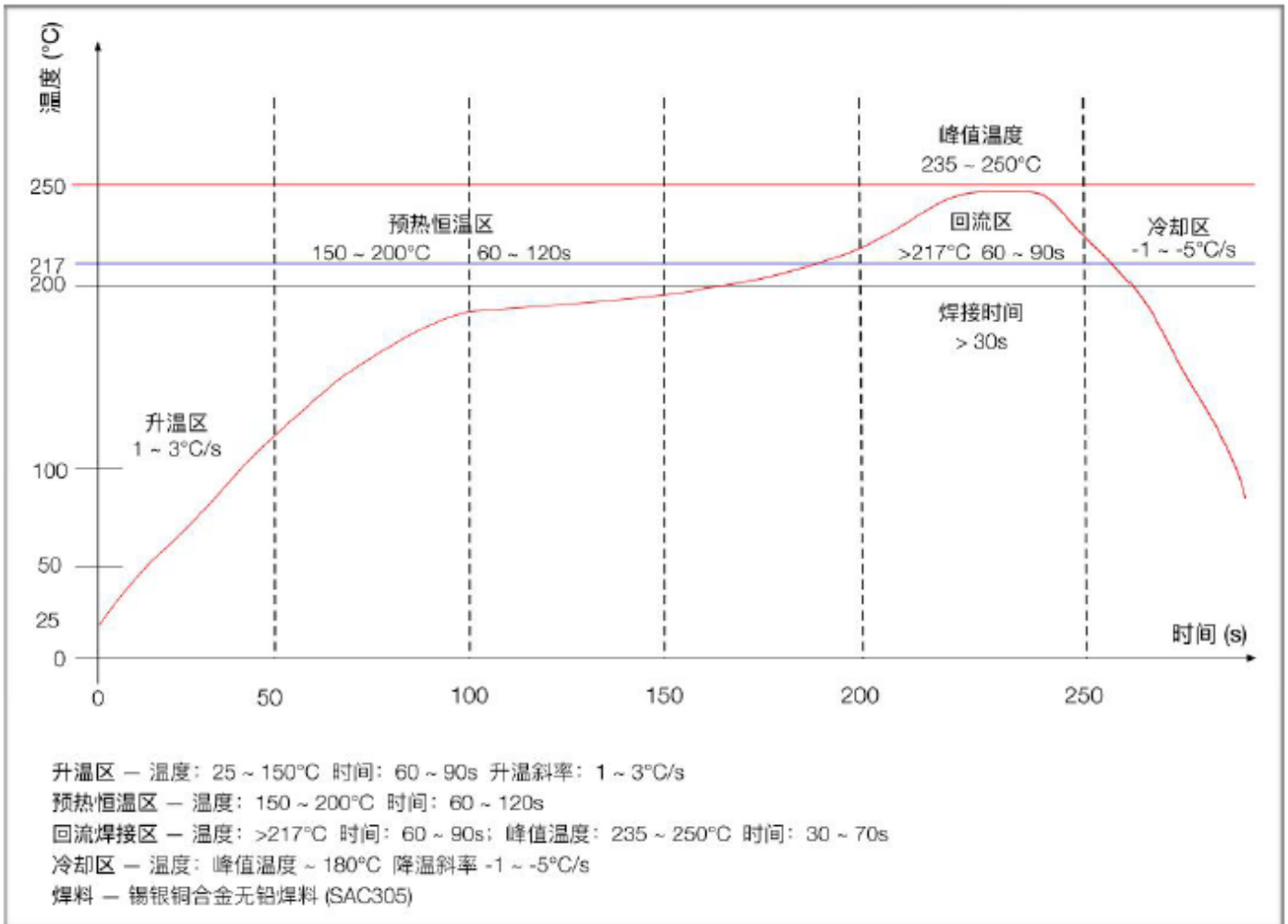


Table Electrical level conversion circuit

## 7 Reflow Soldering



## 8 Packaging Information

Refer to below image, ESP-C3-12F package is in Tape/Reel.



## Simplified Declaration of Conformity (RED)

**BG** - С настоящото RF Solutions Limited декларира, че този тип радиосъоръжение Carlton-8T16 е в съответствие с Директива 2014/53/ЕС. Цялостният текст на ЕС декларацията за съответствие може да се намери на следния интернет адрес: [www.rfsolutions.co.uk](http://www.rfsolutions.co.uk)

**CS** -Tímto RF Solutions Limited prohlašuje, že typ rádiového zařízení Carlton-8T16 je v souladu se směrnicí 2014/53/EU. Úplné znění EU prohlášení o shodě je k dispozici na této internetové adrese: [www.rfsolutions.co.uk](http://www.rfsolutions.co.uk)

**DA** - Hermed erklærer RF Solutions Limited, at radioudstyrstypen Carlton-8T16 er i overensstemmelse med direktiv 2014/53/EU. EU-overensstemmelseserklæringens fulde tekst kan findes på følgende internetadresse: [www.rfsolutions.co.uk](http://www.rfsolutions.co.uk)

**DE** - Hiermit erkläre RF Solutions Limited, dass der Funkanlagentyp Carlton-8T16 der Richtlinie 2014/53/EU entspricht. Der vollständige Text der EU-Konformitätserklärung ist unter der folgenden Internetadresse verfügbar: [www.rfsolutions.co.uk](http://www.rfsolutions.co.uk)

**EL** - Με την παρούσα ο/η RF Solutions Limited, δηλώνει ότι ο ραδιοεξοπλισμός Carlton-8T16 πληροί την οδηγία 2014/53/ΕΕ. Το πλήρες κείμενο της δήλωσης συμμόρφωσης ΕΕ διατίθεται στην ακόλουθη ιστοσελίδα στο διαδίκτυο: [www.rfsolutions.co.uk](http://www.rfsolutions.co.uk)

**EN** - Hereby, RF Solutions Limited declares that the radio equipment type Carlton-8T16 is in compliance with Directive 2014/53/EU. The full text of the EU declaration of conformity is available at the following internet address: [www.rfsolutions.co.uk](http://www.rfsolutions.co.uk)

**ES** - Por la presente, RF Solutions Limited declara que el tipo de equipo radioeléctrico Carlton-8T16 es conforme con la Directiva 2014/53/UE. El texto completo de la declaración UE de conformidad está disponible en la dirección Internet siguiente: [www.rfsolutions.co.uk](http://www.rfsolutions.co.uk)

**ET** -Käesolevaga deklareerib RF Solutions Limited, et käesolev raadioseadme tüüp Carlton-8T16 vastab direktiivi 2014/53/EL nõuetele. Eli vasta-vusdeklaratsiooni täielik tekst on kättesaadav järgmisel internetiaadressil: [www.rfsolutions.co.uk](http://www.rfsolutions.co.uk)

**FI** -RF Solutions Limited vakuuttaa, että radiolaitetyyppi Carlton-8T16 on direktiivin 2014/53/EU mukainen. EU-vaatimustenmukaisuusvakuutuksen täy-simittainen teksti on saatavilla seuraavassa internetosoitteessa: [www.rfsolutions.co.uk](http://www.rfsolutions.co.uk)

**FR** - Le soussigné, RF Solutions Limited, déclare que l'équipement radioélectrique du type Carlton-8T16 est conforme à la directive 2014/53/UE. Le texte complet de la déclaration UE de conformité est disponible à l'adresse internet suivante: [www.rfsolutions.co.uk](http://www.rfsolutions.co.uk)

**HR** - RF Solutions Limited ovime izjavljuje da je radijska oprema tipa Carlton-8T16 u skladu s Direktivom 2014/53/EU. Cjeloviti tekst EU izjave o suklad-nosti dostupan je na sljedećoj internetskoj adresi: [www.rfsolutions.co.uk](http://www.rfsolutions.co.uk)

**HU** - RF Solutions Limited igazolja, hogy a Carlton-8T16 típusú rádióberendezés megfelel a 2014/53/EU irányelvnek. Az EU-megfelelőségi nyilatkozat teljes szövege elérhető a következő internetes címen: [www.rfsolutions.co.uk](http://www.rfsolutions.co.uk)

**IT** - Il fabbricante, RF Solutions Limited, dichiara che il tipo di apparecchiatura radio Carlton-8T16 è conforme alla direttiva 2014/53/UE. Il testo completo della dichiarazione di conformità UE è disponibile al seguente indirizzo Internet: [www.rfsolutions.co.uk](http://www.rfsolutions.co.uk)

**LT** - Aš, RF Solutions Limited, patvirtinu, kad radijo įrenginių tipas Carlton-8T16 atitinka Direktyvą 2014/53/ES. Visas ES atitikties deklaracijos tekstas prieinamas šiuo interneto adresu: [www.rfsolutions.co.uk](http://www.rfsolutions.co.uk)

**LV** - Ar šo RF Solutions Limited deklarē, ka radioiekārta Carlton-8T16 atbilst Direktīvai 2014/53/ES. Pilns ES atbilstības deklarācijas teksts ir pieejams šādā interneta vietnē: [www.rfsolutions.co.uk](http://www.rfsolutions.co.uk)

**MT** - B'dan, RF Solutions Limited, niddikjara li dan it-tip ta' taghmir tar-radju Carlton-8T16 huwa konformi mad-Direttiva 2014/53/UE. It-test kollu tad-dikjarazzjoni ta' konformità tal-UE huwa disponibbli f'dan l-indirizz tal-Internet li ġej: [www.rfsolutions.co.uk](http://www.rfsolutions.co.uk)

**NL** - Hierbij verklaar ik, RF Solutions Limited, dat het type radioapparatuur Carlton-8T16 conform is met Richtlijn 2014/53/EU. De volledige tekst van de EU-conformiteitsverklaring kan worden geraadpleegd op het volgende internetadres: [www.rfsolutions.co.uk](http://www.rfsolutions.co.uk)

**PL** - RF Solutions Limited niniejszym oświadczam, że typ urządzenia radiowego Carlton-8T16 jest zgodny z dyrektywą 2014/53/UE. Pełny tekst deklaracji zgodności UE jest dostępny pod następującym adresem internetowym: [www.rfsolutions.co.uk](http://www.rfsolutions.co.uk)

**PT** - O(a) abaixo assinado(a) RF Solutions Limited declara que o presente tipo de equipamento de rádio Carlton-8T16 está em conformidade com a Dire-tiva 2014/53/UE. O texto integral da declaração de conformidade está disponível no seguinte endereço de Internet: [www.rfsolutions.co.uk](http://www.rfsolutions.co.uk)

**RO** - Prin prezenta, RF Solutions Limited declară că tipul de echipamente radio Carlton-8T16 este în conformitate cu Directiva 2014/53/UE. Textul integral al declarației UE de conformitate este disponibil la următoarea adresă internet: [www.rfsolutions.co.uk](http://www.rfsolutions.co.uk)

**SK** - RF Solutions Limited týmto vyhlasuje, že rádiové zariadenie typu Carlton-8T16 je v súlade so smernicou 2014/53/EÚ. Úplné EÚ vyhlásenie o zhode je k dispozícii na tejto internetovej adrese: [www.rfsolutions.co.uk](http://www.rfsolutions.co.uk)

**SL** - RF Solutions Limited potrjuje, da je tip radijske opreme Carlton-8T16 skladen z Direktivo 2014/53/EU. Celotno besedilo izjave EU o skladnosti je na voljo na naslednjem spletnem naslovu: [www.rfsolutions.co.uk](http://www.rfsolutions.co.uk)

**SV** - Härmed försäkrar RF Solutions Limited att denna typ av radioutrustning Carlton-8T16 överensstämmer med direktiv 2014/53/EU. Den fullständiga texten till EU-försäkran om överensstämmelse finns på följande webbadress: [www.rfsolutions.co.uk](http://www.rfsolutions.co.uk)

### RF Solutions Ltd. Recycling Notice

Meets the following EC Directives:

#### DO NOT

Discard with normal waste, please recycle.

#### ROHS Directive 2011/65/EU and amendment 2015/863/EU:

Specifies certain limits for hazardous substances.

**WEEE Directive 2012/19/EU** waste electrical & electronic equipment. This product must be disposed of through a licensed WEEE collection point. RF Solutions Ltd., fulfils its WEEE obligations by membership of an approved compliance scheme.

**Environment Agency Registration Number:** WEE/JB0104WV.



### Waste Batteries and Accumulators Directive 2006/66/EC

Where batteries are fitted, before recycling the product, the batteries must be removed and disposed of at a licenced collection point. RF Solutions battery producer number:

**BPRN00060.**

#### Disclaimer:

Whilst the information in this document is believed to be correct at the time of issue, RF Solutions Ltd does not accept any liability whatsoever for its accuracy, adequacy or completeness. No express or implied warranty or representation is given relating to the information contained in this document. RF Solutions Ltd reserves the right to make changes and improvements to the product(s) described herein without notice. Buyers and other users should determine for themselves the suitability of any such information or products for their own particular requirements or specification(s). RF Solutions Ltd shall not be liable for any loss or damage caused as a result of user's own determination of how to deploy or use RF Solutions Ltd's products. Use of RF Solutions Ltd products or components in life support and/or safety applications is not authorised except with express written approval. No licences are created, implicitly or otherwise, under any of RF Solutions Ltd's intellectual property rights. Liability for loss or damage resulting or caused by reliance on the information contained herein or from the use of the product (including liability resulting from negligence or where RF Solutions Ltd was aware of the possibility of such loss or damage arising) is excluded. This will not operate to limit or restrict QuasarUK Ltd's liability for death or personal injury resulting from its negligence.

[www.rfsolutions.co.uk](http://www.rfsolutions.co.uk)

RF Solutions Ltd

William Alexander House, William Way, Burgess Hill, West Sussex, RH15 9AG

Sales: +44 (0)1444 227900

Tech Support: +44 (0)1444 227909