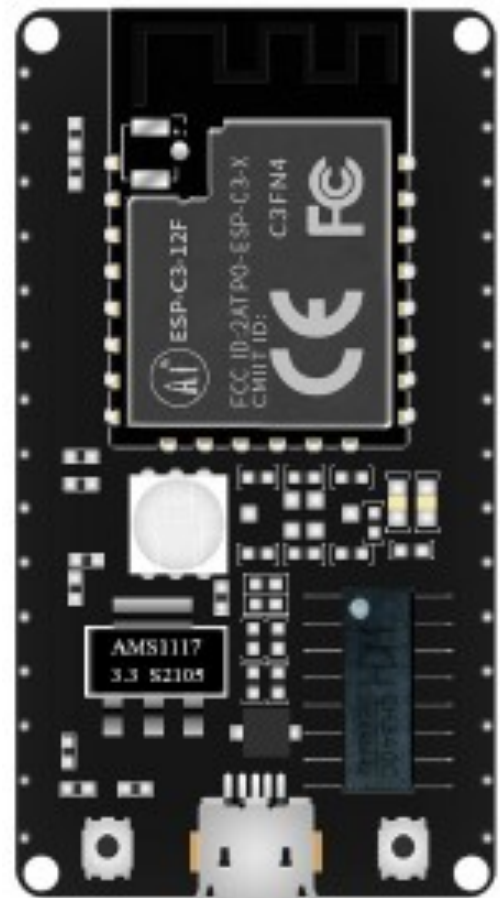


## ESP WIFI MODULE DEVELOPMENT KIT

### Features

- Support Wi-Fi 802.11b/g/n, 1T1R mode data rate up to 150Mbps
- Support BLE5.0, does not support classic Bluetooth, rate support: 125Kbps, 500Kbps, 1Mbps, 2Mbps
- RISC-V 32-bit single-core processor, supports a clock frequency of up to 160 MHz, has 400 KB SRAM, 384 KB ROM, 8KB RTC SRAM
- Support UART/PWM/GPIO/ADC/I2C/I2S interface, support temperature sensor, pulse counter
- The development board has RGB three-in-one lamp beads, which is convenient for the second development of customers
- Support multiple sleep modes, deep sleep current is less than 5uA
- Serial port rate up to 5Mbps
- Support STA/AP/STA+AP mode and promiscuous mode
- Support Smart Config (APP)/AirKiss (WeChat) of Android and IOS, one-click network configuration
- Support serial port local upgrade and remote firmware upgrade (FOTA)
- General AT commands can be used quickly
- Support secondary development, integrated Windows and Linux development environment
- About Flash configuration ESP-C3-12F uses the built-in 4MByte Flash of the chip by default, and supports the external Flash version of the chip.



### Product Overview

The ESP-C3-12F-Kit development board is a core development board designed by ESP-C3-12F for the ESP-C3-12F module. The development board continues the classic design of the NodeMCU development board, leading all I/O to the With pin headers, developers can connect peripherals according to their needs. When using the breadboard for development and debugging, the standard headers on both sides can make the operation easier and more convenient. The module's core processor chip ESP32-C3 is a highly integrated low-power Wi-Fi and Bluetooth system-on-chip (SoC), designed for the Internet of Things (IoT), mobile devices, wearable electronic

devices, smart homes, etc. Designed for various applications.

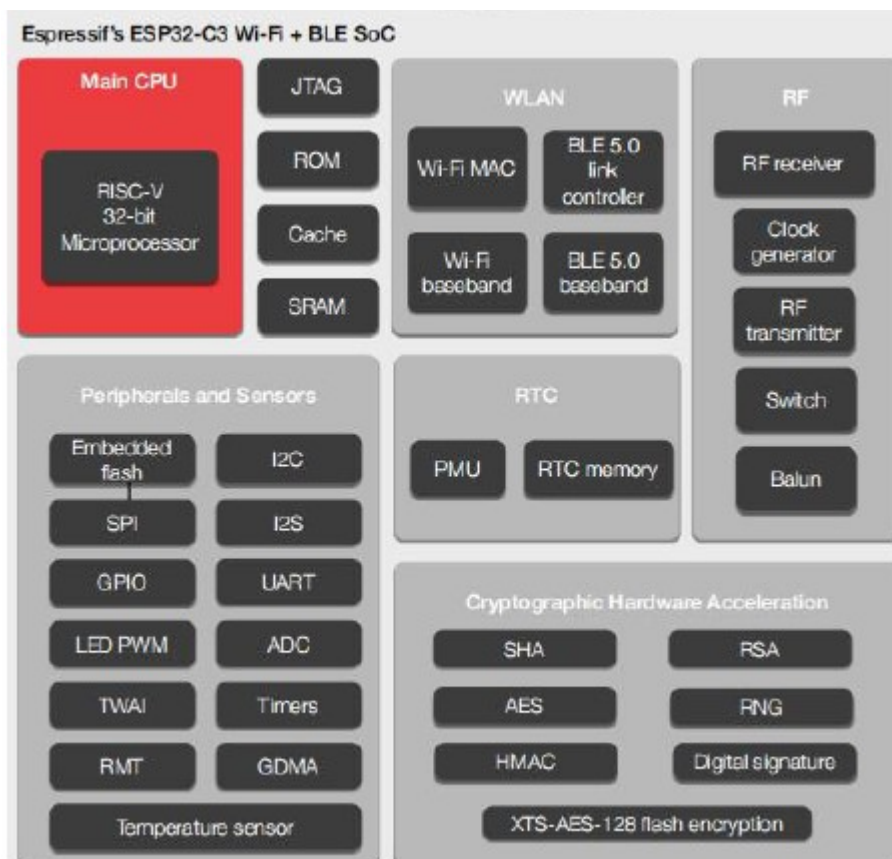
The ESP32-C3 chip has industry-leading low-power performance and radio frequency performance, and supports Wi-Fi IEEE802.11b/g/n protocol and BLE 5.0. The chip is equipped with a RISC-V 32-bit single-core processor with an operating frequency of up to 160 MHz.

Support secondary development without using other microcontrollers or processors. The chip has built-in 400 KB SRAM, 384 KB ROM, 8KB RTC SRAM, built-in 4MB Flash also supports external Flash. The 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 rate and power consumption.

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

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

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



## 1.1. Main Parameters

List 1 Main Parameters Description

<b>Model</b>	ESP-C3-12F-Kit
<b>Packaging</b>	DIP-30
<b>Size(module)</b>	25.5*18.0*3.1(±0.2)MM
<b>Antenna</b>	PCB antenna/IPEX port
<b>Spectrum range</b>	2400 ~ 2483.5MHz
<b>Working temperature</b>	-40 °C ~ 85 °C
<b>Storage environment</b>	-40 °C ~ 125 °C , < 90%RH
<b>Power supply</b>	Voltage 5V, current >500mA
<b>Interface</b>	UART/GPIO/ADC/PWM/I2C/I2S
<b>IO port</b>	IO0,IO1,IO2,IO3,IO4,IO5,IO8,IO9,IO10,IO18,IO19,IO20,IO21
<b>Serial port rate</b>	Support 110 ~ 4608000 bps , default 115200 bps
<b>Bluetooth</b>	BLE 5.0
<b>Safety</b>	WEP/WPA-PSK/WPA2-PSK
<b>SPI Flash</b>	Default 4MByte, support 2MByte version
<b>Onboard RGB interface</b>	IO5 connects to RGB blue lamp beads; IO3 connects to RGB red lamp beads; IO4 connects to RGB green lamp beads

## 2.1 Electrical Parameters

The ESP-C3-12F-Kit development board is an electrostatic sensitive device, and special precautions need to be taken when handling it.



## 2.1 Electrical Characteristics

Parameters	Conditions	Min	Typical	Max	Unit	
Voltage	VDD	3.0	3.3	5.0	V	
I/O	V <sub>IL</sub> /V <sub>IH</sub>	-	-0.3/0.75VDD	-	0.25VDD/VDD+0.3	V
	V <sub>OL</sub> /V <sub>OH</sub>	-	N/0.8VIO	-	0.1VIO/N	V
	I <sub>MAX</sub>	-	-	-	12	mA

## 2.2 WIFI RF Performance

Description	Typical	Unit
Working frequency	2400 - 2483.5	MHz
<b>Output Power</b>		
11n mode HT40, PA output power is	15±2	dBm
11n mode HT20, PA output power is	15±2	dBm
In 11g mode, PA output power is	16±2	dBm
In 11b mode, PA output power	18±2	dBm
<b>Receiving sensitivity</b>		
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	Unit
<b>Output Power</b>		
Transmit power	0±2	dBm
<b>Receiving sensitivity Bluetooth low energy 1M</b>		
Sensitivity @30.8%PER	-96±2	dBm

## 2.4 Power Consumption

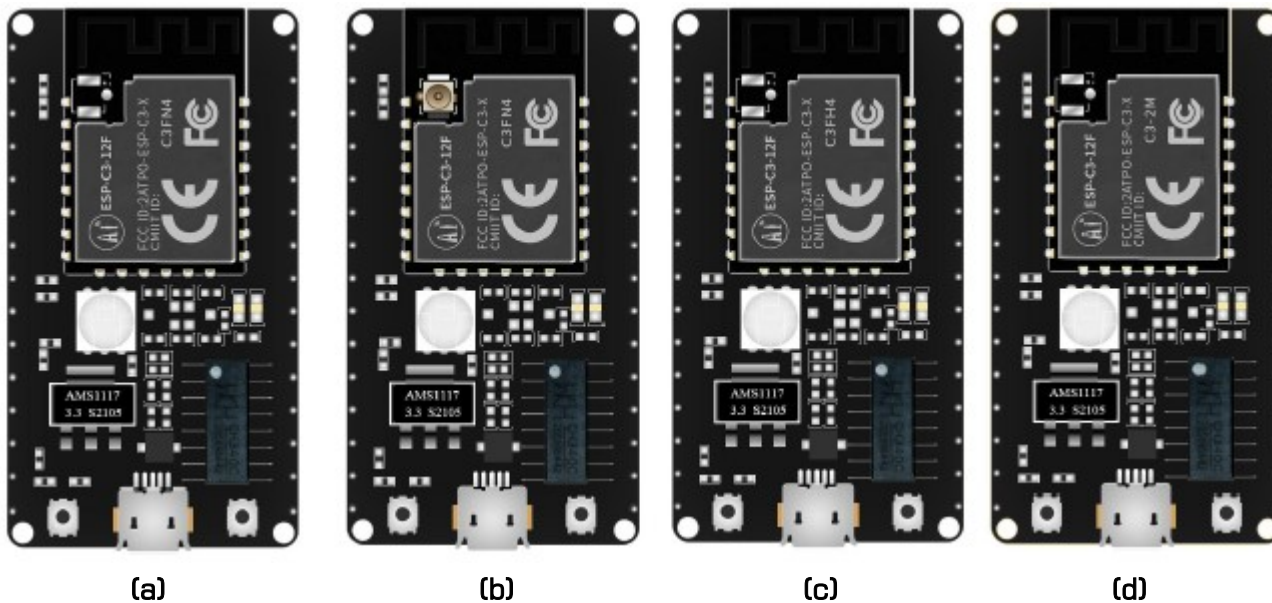
The following power consumption data is based on a 3.3V power supply, an ambient temperature of 25°C, and measured using an internal voltage regulator.

- All measurements are done at the antenna interface without SAW filter.
- All emission data is based on 90% duty cycle, measured in continuous emission mode.

Mode	Mix	Typical	Max	Unit
Transmit 802.11b, CCK 1Mbps, POUT=+20dBm	-	350	-	mA
Transmit 802.11g, OFDM 54Mbps, POUT =+18dBm	-	290	-	mA
Transmit 802.11n, MCS7, POUT =+17dBm	-	280	-	mA
Receive 802.11b, the packet length is 1024 bytes	-	90	-	mA
Receive 802.11g, the packet length is 1024 bytes	-	90	-	mA
Receive 802.11n, the packet length is 1024 bytes	-	93	-	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. Exterior

The appearance of four different packages of ESP-C3-12F-Kit development board



(The picture and silk screen are for reference only, the actual product shall prevail)

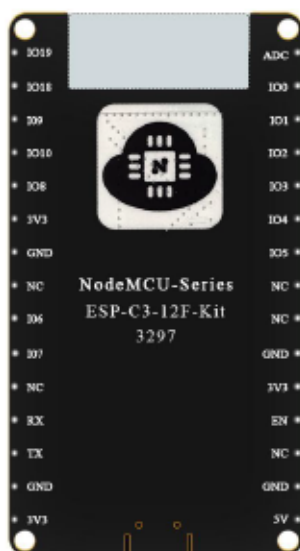
Different package selection description:

Figure (a) Type package (normal version): Compatible with PCB onboard antenna and IPEX external antenna, built-in 4M flash;

Figure (b) Type package (normal version): Compatible with PCB onboard antenna and IPEX external antenna, built-in 4M flash;

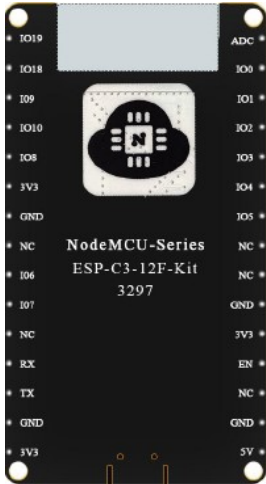
Figure (c) Type package (high temperature version): Compatible with PCB onboard antenna and IPEX external antenna, built-in 4M flash;

Figure (d) Type package: compatible with PCB onboard antenna and IPEX external antenna, external 2M flash;



(The picture and silk screen are for reference only, the actual product shall prevail)

## 4. Pin Description



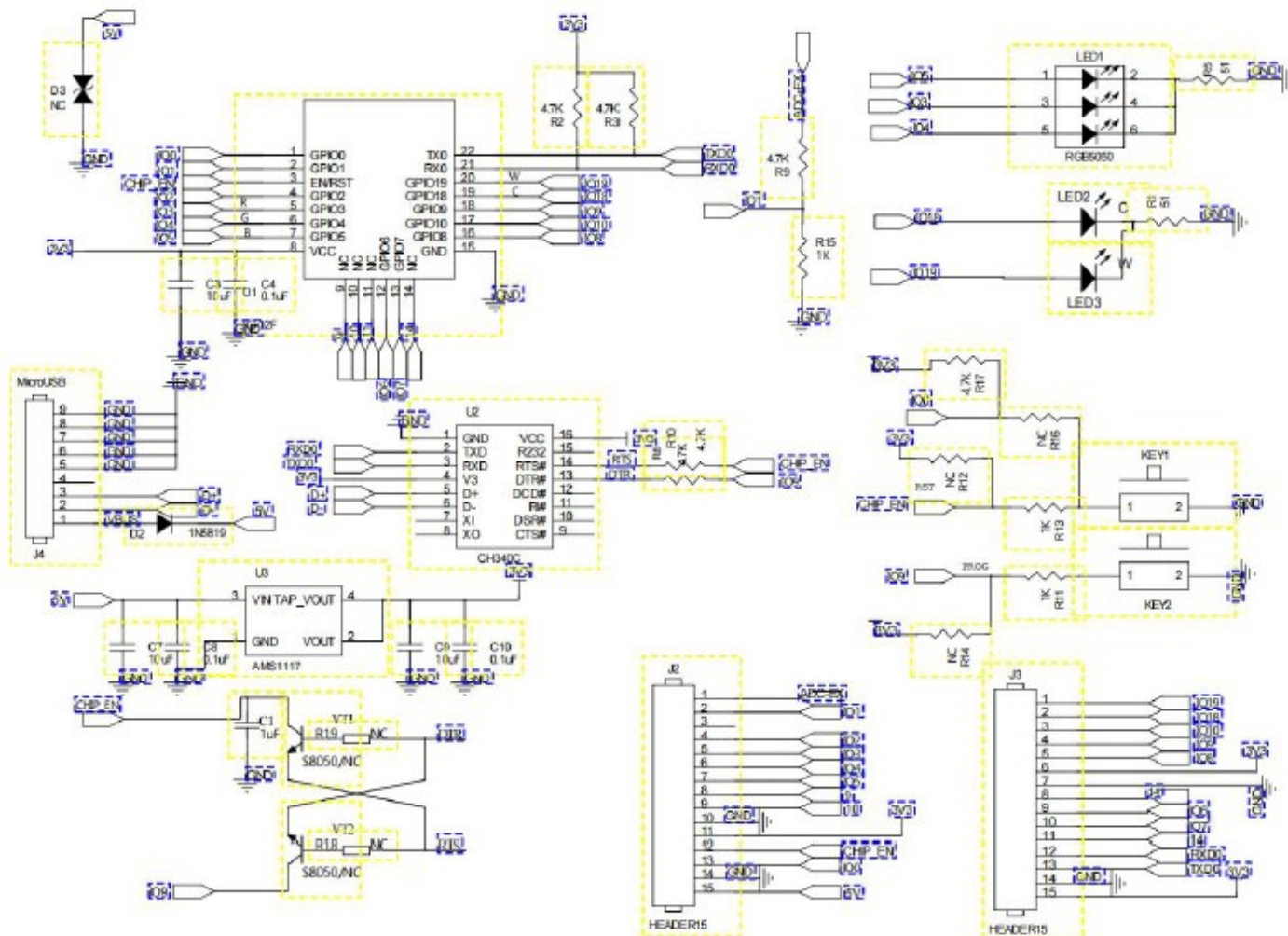
*ESP-C3-12F-Kit  
pin diagram*

The ESP-C3-12F-Kit development board module has a total of 30 interfaces, as shown in the pin diagram, the pin function definition table is the interface definition table.

*Pin function definition table*

No.	Name	Function description
1	ADC	ADC_CHECK(ADC1_CH0)
2	IO0	IO0 / ADC1_CH0 / XTAL_32K_N
3	IO1	IO1 / ADC1_CH1 / XTAL_32K_N
4	IO2	IO2 / ADC1_CH2 / FSPIQ
5	IO3	IO03 / ADC1_CH3
6	IO4	IO04 / ADC1_CH4 / FSPIHD / MTMS
7	IO5	IO05 / ADC2_CH0 / FSPIWP / MTDI
8	NC	NC
9	NC	NC
10	GND	GND
11	3V3	Digital 3.3V power output
12	EN	High level: chip enable;Low level: the chip is turned off; Note that the EN pin should not be left floating;
13	NC	NC
14	GND	GND
15	5V	5V power input
16	3V3	Digital 3.3V power output
17	GND	GND
18	TX	TX0 / IO21
19	RX	RX0 / IO20
20	NC	NC
21	IO7	IO7 / FSPID / MTDO
22	IO6	IO6 / FSPICK / MTCK
23	NC	NC
24	GND	GND
25	3V3	Digital 3.3V power output
26	IO8	IO8
27	IO10	IO10 / FSPICSO
28	IO9	IO9
29	IO18	IO18
30	IO19	IO19

## 5. Schematic Diagrams



## 6. Design Guidance

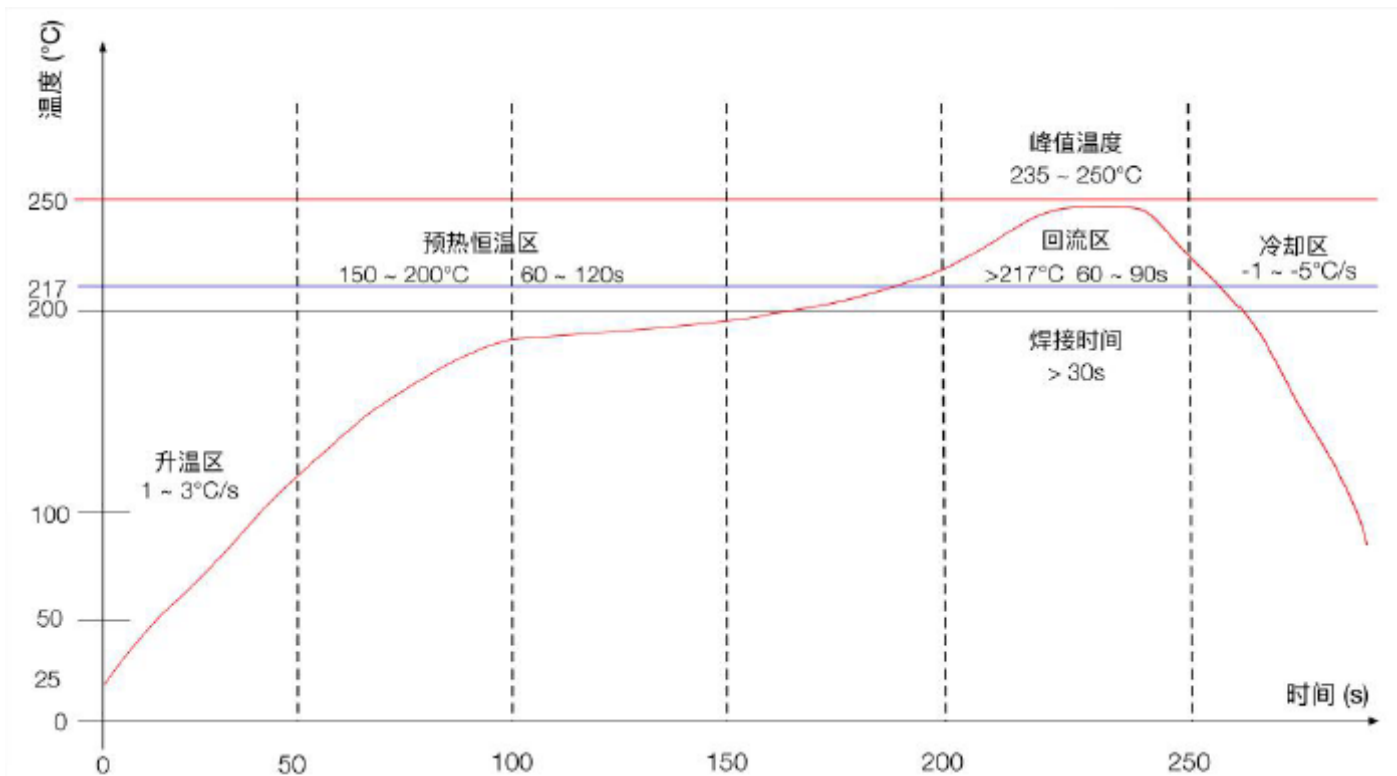
### 6.1 Power supply

- Recommended 5V voltage, peak current above 500mA
- It is recommended to use LDO for power supply; if using DC-DC, it is recommended that the ripple be controlled within 30mV
- It is recommended to reserve the position of the dynamic response capacitor for the DC-DC power supply circuit, which can optimize the output ripple when the load changes greatly.
- It is recommended to add ESD devices to the 5V power interface

## 6.2 Antenna layout requirements

It is forbidden to place metal parts around the module antenna, away from high-frequency components.

## 7. Reflow Soldering Curve



升温区 — 温度: 25 ~ 150°C 时间: 60 ~ 90s 升温斜率: 1 ~ 3°C/s  
预热恒温区 — 温度: 150 ~ 200°C 时间: 60 ~ 120s  
回流焊接区 — 温度: >217°C 时间: 60 ~ 90s; 峰值温度: 235 ~ 250°C 时间: 30 ~ 70s  
冷却区 — 温度: 峰值温度 ~ 180°C 降温斜率 -1 ~ -5°C/s  
焊料 — 锡银铜合金无铅焊料 (SAC305)

## 8. Packaging Information

The packaging of the ESP-C3-12F-Kit development board is an electrostatic bag with pearl cotton inserted.

## 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' konformita 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 radioapparaat 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.



#### 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