RF-WM-3220B1 CC3220SF

Low Power Wi-Fi Module

Version 1.0

Shenzhen RF-star Technology Co., Ltd.

May 25th, 2023

1 Device Overview

1.1 Description

RF-WM-3220B1 series is a low power Wi-Fi SoC module which is based on TI SimpleLink™ Wi-Fi® SoC CC3220SF, which has a built-in ARM Cortex™-M4 core processor with a user-dedicated 256 KB of RAM and an optional 1 MB of serial flash, a network processor MCU runs all Wi-Fi® and internet logical layers, and a variety of peripherals including parallel camera interface, I²S, SD/MMC, UART, SPI, I²C, ADC and GPIOs. The ROM-based subsystem of RF-WM-3220B1 includes an IEEE 802.11 b/g/n radio, baseband, and MAC with a powerful crypto engine. The module supports station, access point with support of four stations, and Wi-Fi Direct™ modes. The device also supports WPA2 personal and enterprise security and WPS 2.0. The Wi-Fi Internet-on-a-chip includes embedded IPv4 and IPv6 TCP/IP protocols. The power-management subsystem includes integrated DC-DC converters supporting a wide range of supply voltages. This subsystem enables low-power consumption modes, such as the hibernate with RTC mode requiring less than 4.5 μA of current. The module design provides 3 options for antenna integration, including surface mounted chip antenna, an IPEX interface for connecting an external antenna, and a RF pad for soldering onto the base board and routing to an on-board antenna. RF-WM-3220B1 series is pin-2-pin compatible with RF-WM-3200B1.

1.2 Key Features

- Dual-core architecture
  - User-dedicated application MCU subsystem
  - Highly-integrated Wi-Fi network processor
- Rich set of IoT networking security
  - Enhanced IoT networking security
  - Asymmetric keys and unique device identity
  - Software IP protection and Secure storage
- Advance low-power modes for battery powered applications
- Built-in power management subsystem
- Chip-level Wi-Fi CERTIFIED™ Chip
- Application microcontroller subsystem:
  - ARM® Cortex®-M4 core at 80 MHz
  - Embedded memory
    - 256 KB RAM
    - Optional 1 MB of executable flash
    - External serial flash
  - Peripherals
    - McASP supports two I²S channels
    - SD, SPI, I²C, UART
    - 8-bit synchronous imager interface
    - 4 general-purpose timers with 16-bit PWM mode
    - 1 watchdog timer
    - 4-channel 12-bit ADCs
    - Up to 27 individually programmable, multiplexed GPIO pins
    - Debug interfaces: JTAG, cJTAG, SWD
- Wi-Fi network processor subsystem
  - Wi-Fi modes:
    - 802.11b/g/n station
    - 802.11b/g access point (AP) supports up to four stations
    - Wi-Fi direct® client and group owner

- WPA2 personal and enterprise security: WEP, WPA™ / WPA2™ PSK, WPA2 enterprise (802.1x)
- IPv4 and IPv6 TCP / IP stack
- Industry-standard BSD socket application programming interfaces (APIs)
  - ➢ 16 simultaneous TCP or UDP sockets
  - ➢ 6 simultaneous TLS or SSL sockets
- IP addressing: static IP, LLA, DHCPv4, DHCPv6 with duplicate address detection (DAD)
- SimpleLink connection manager for autonomous and fast Wi-Fi connections
- Flexible Wi-Fi provisioning with SmartConfig™ technology, AP mode, and WPS2 options
- RESTful API support using the internet HTTP server

• Wide set of security features

- Hardware features
  - ➢ Separate execution environments
  - ➢ Device identity
  - ➢ Hardware crypto engine for advanced fast security, including: AES, DES, 3DES, SHA2, MD5, CRC, and Checksum
  - ➢ Initial secure programming:
    - Debug security
    - JTAG and Debug ports are locked
  - ➢ Personal and enterprise Wi-Fi security
  - ➢ Secure sockets (SSLv3, TLS1.0, TSL1.1, TLS1.2)
  - ➢ HTTPS server
  - ➢ Trusted root-certificate catalog
  - ➢ TI root-of-trust public key
- Networking security
  - ➢ Personal and enterprise Wi-Fi security
  - ➢ Secure sockets (SSLv3, TLS1.0, TSL1.1, TLS1.2)
  - ➢ HTTPS server
  - ➢ Trusted root-certificate catalog
  - ➢ TI root-of-trust public key
- Software IP protection
  - ➢ Security key storage
  - ➢ File system security
  - ➢ Software tamper detection
  - ➢ Cloning protection
  - ➢ Secure boot: validate the integrity and authenticity of the runtime binary during boot
- Embedded network applications running on the dedicated network processor
  - ➢ HTTP / HTTPS web server with dynamic user callbacks
  - ➢ mDNS, DNS-SD, DHCP server
  - ➢ Ping
- Recovery mechanism – can recover to factory defaults or to a complete factory image
- Wi-Fi TX power
  - ➢ 18.0 dBm @ 1 DSSS
  - ➢ 14.5 dBm @ 54 OFDM
- Wi-Fi RX sensitivity
  - ➢ -96 dBm @ 1 DSSS
  - ➢ -74.5 dBm @ 54 OFDM
- Application throughput
  - ➢ UDP: 16 Mbps
  - ➢ TCP: 13 Mbps
  - ➢ Peak: 72 Mbps

• Power-Management Subsystem:

- Integrated DC/DC converters support a wide range of supply voltage:
  - ➢ V_{BAT} wide-voltage supply: 2.7 V ~ 3.6 V

- VIO is always tied with VBAT
- Preregulated 1.85 V mode

- Advanced low-power modes:
  - Shutdown: 1 µA
  - Hibernate: 4.5 µA
  - Low-power deep sleep (LPDS): 135 µA (measured on CC3220R, CC3220S, and CC3220SF with 256KB RAM retention)
  - RX traffic (MCU active): 59 mA @ 54 OFDM (measured on CC3220R and CC3220S; CC3220SF consumes an additional 10 mA)
  - TX traffic (MCU active): 223 mA @ 54 OFDM, maximum power (measured on CC3220R and CC3220S; CC3220SF consumes an additional 15 mA)
  - Idle connected (MCU in LPDS): 710 µA @ DTIM = 1 (measured on CC3220R and CC3220S with 256 KB RAM retention)

1.3 Applications

- HVAC systems & thermostat
- Video surveillance
- Video doorbells
- Low-power camera
- Building security systems
- E-locks
- Access tracking
- Factory automation
- Medical and health care
- Industrial control

1.4 Functional Block Diagram

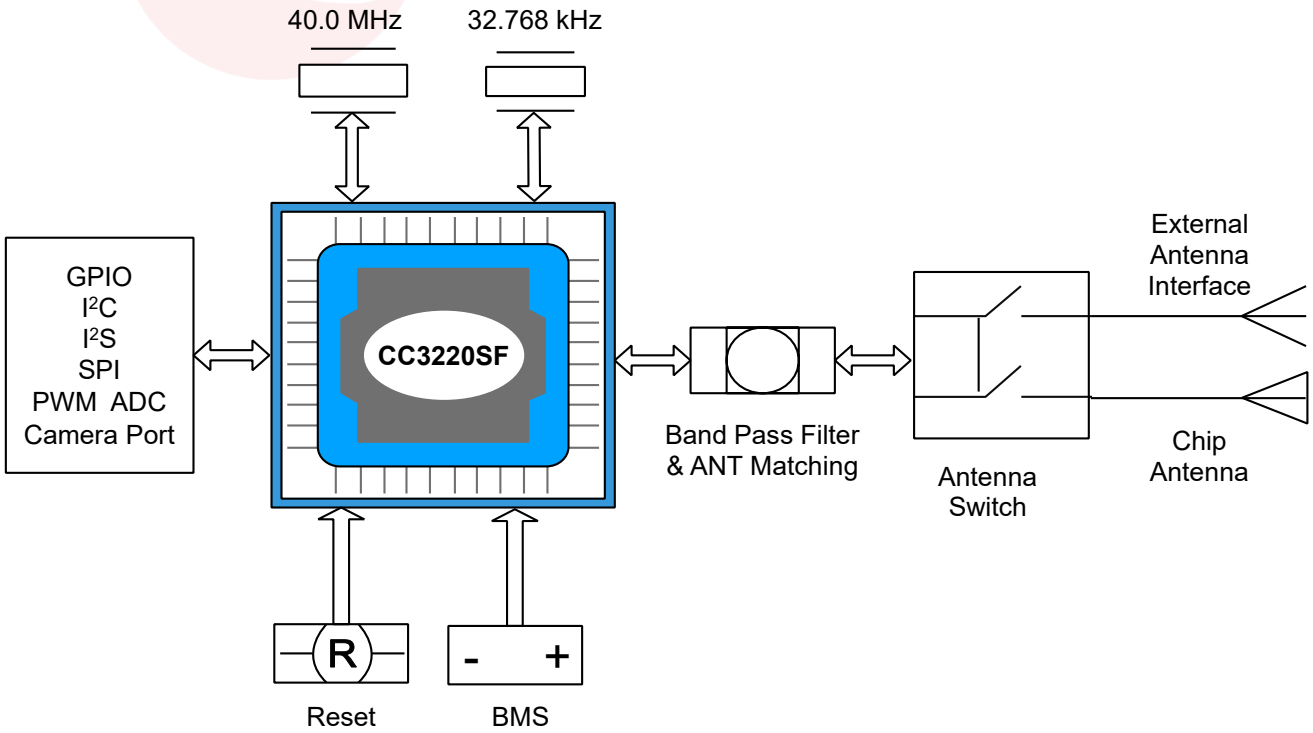


Figure 1. Functional Block Diagram of RF-WM-3220B1 Series

1.5 Part Number Conventions

The part numbers are of the form of RF-WM-3220B1 series where the fields are defined as follows:

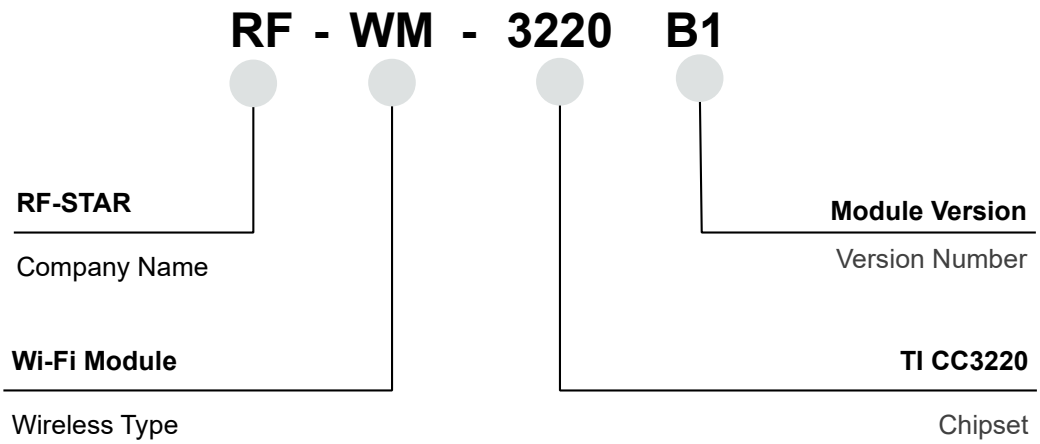


Figure 2. Part Number Conventions of RF-WM-3220B1 Series

Table of Contents

2 Module Configuration and Functions

2.1 Module Parameters

Table 1. Parameters of RF-WM-3220B1

Chipset	CC3220SF
Supply Power Voltage	2.7 V ~ 3.6 V, 3.3 V is recommended
Frequency	2.4 GHz
Working Mode	802.11 b/g/n station, 802.11 b/g/n access point with support of 4 stations, Wi-Fi Direct® Client and Group Owner
Transmit Power	+18.0 dBm @ 1 DSSS +14.5 dBm @ 54 OFDM
Receiving Sensitivity	-95.7 dBm @ 1 DSSS -74.0 dBm @ 54 OFDM
GPIO	29
Power Consumption	Shutdown: 1 μA Hibernate: 4.5 μA Low-power deep sleep (LPDS): 135 μA Idle connected (MCU in LPDS): 710 μA @ DTIM = 1 RX traffic (MCU active): 59 mA @ 54 OFDM TX traffic (MCU active): 223 mA @ 54 OFDM, maximum power
Crystal	40 MHz, 32.768 kHz
Package	SMT packaging, half-hole packaging
Communication Interface	UART, I²S, I²C, SPI, SD/MMC, ADC, DMA, PWM, McASP, Camera interface
Dimension	31.0 mm × 20.0 mm × 2.3 mm
Operating Temperature	-30 ℃ ~ +85 ℃
Storage Temperature	-55 ℃ ~ +125 ℃

2.2 Module Pin Diagram

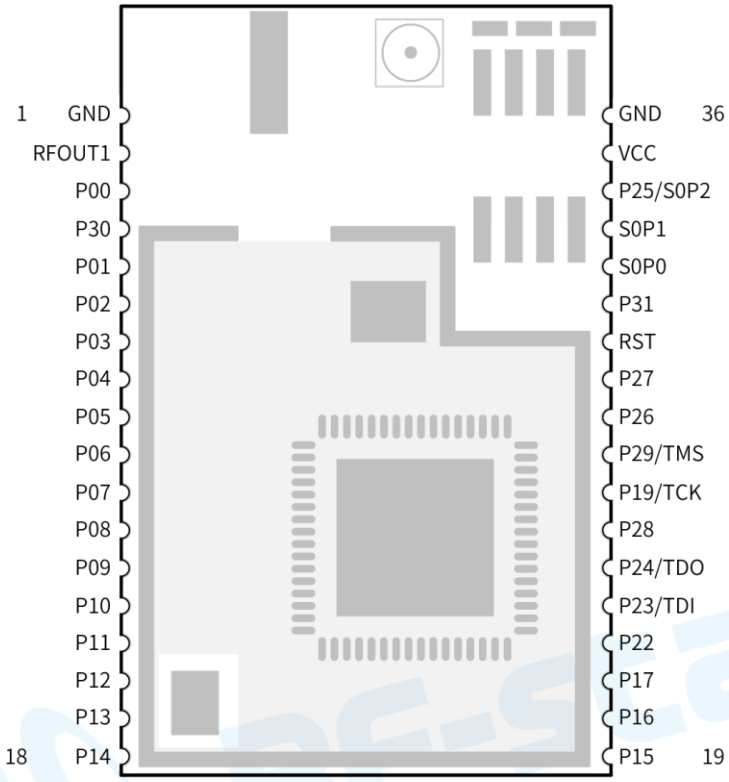


Figure 3. Pin Diagram of RF-WM-3220B1 Series

2.3 Pin Functions

Table 2. Pin Functions of RF-WM-3220B1 Series

Pin	Chip Pin	Name	Function
1		GND	Ground
2		RF_OUT	RF output interface
3	50	GPIO00	GPIO0
			UART0_CTS
			McAXR1
			GT_CCP00
			GSPI_CS
			UART1_RTS
			UART0_RTS

			McAXR0
4	53	GPIO30	GPIO30
			UART0_TX
			McACLK
			McAFSX
			GT_CCP05
			GSPI_MISO
5	55	GPIO01	GPIO1
			UART0_TX
			pCLK Pixel (PIXCLK)
			UART1_TX
			GT_CCP01
6	57	GPIO02	ADC_CH0
			GPIO2
			UART0_RX
			UART1_RX
			GT_CCP02
7	58	GPIO03	ADC_CH1
			GPIO3
			UART1_TX
			pDATA7(CAM_D3)
8	59	GPIO04	ADC_CH2
			GPIO4
			UART1_RX
			pDATA6 (CAM_D2)
9	60	GPIO05	ADC_CH3
			GPIO5
			pDATA5 (CAM_D1)

			McAXR1
			GT_CCP05
10	61	GPIO06	GPIO6
			UART0_RTS
			pDATA4 (CAM_D0)
			UART1_CTS
			UART0_CTS
			GT_CCP06
11	62	GPIO07	GPIO7
			McACLKX
			UART1_RTS
			UART0_RTS
			UART0_TX
12	63	GPIO08	GPIO8
			SDCARD_IRQ
			McAFSX
			GT_CCP06
13	64	GPIO09	GPIO9
			GT_PWM05
			SDCARD_DATA0
			McAXR0
			GT_CCP00
14	1	GPIO10	GPIO10
			I2C_SCL
			GT_PWM06
			UART1_TX
			SDCARD_CLK
			GT_CCP01

15	2	GPIO11	GPIO11
			I2C_SDA
			GT_PWM07
			pXCLK(XVCLK)
			SDCARD_CMD
			UART1_RX
			GT_CCP02
			McAFSX
16	3	GPIO12	GPIO12
			McACLK
			pVS (VSYNC)
			I2C_SCL
			UART0_TX
			GT_CCP03
17	4	GPIO13	GPIO13
			I2C_SDA
			pHS (HSYNC)
			UART0_RX
			GT_CCP04
18	5	GPIO14	GPIO14
			I2C_SCL
			GSPI_CLK
			pDATA8 (CAM_D4)
			GT_CCP05
19	6	GPIO15	GPIO15
			I2C_SDA
			GSPI_MISO
			pDATA9(CAM_D5)

			GT_CCP06
			SDCARD_DATA0
20	7	GPIO16	GPIO16
			GSPI_MOSI
			pDATA10 (CAM_D6)
			UART1_TX
			GT_CCP07
			SDCARD_CLK
21	8	GPIO17	GPIO17
			UART1_RX
			GSPI_CS
			pDATA11 (CAM_D7)
			SDCARD_CMD
22	15	GPIO22	GPIO22
			McAFSX
			GT_CCP04
23	16	JTAG TDI	TDI
			GPIO23
			UART1_TX
			I2C_SCL
24	17	JTAG TDO	TDO
			GPIO24
			PWM0
			UART1_RX
			I2C_SDA
			GT_CCP06
			McAFSX
25	18	GPIO28	GPIO28

26	19	JTAG TCK	TCK
			GT_PWM03
27	20	JTAG TMS	TMS
			GPIO29
28	29	ANTSEL1	I/O
29	30	ANTSEL2	I/O
30	32	RESET	Module reset pin, internal pull-up by default, active low
31	45	DCDC_ANA2	GPIO31
			UART0_RX
			McAFSX
			UART1_RX
			McAXR0
			GSPI_CLK
			DCDC_ANA2_SW_P
32	35	SOP0	SOP0
33	34	SOP1	SOP1
34	21	SOP2	GPIO25
			GT_PWM02
			McAFSX
			TCXO_EN
			SOP2
35		VCC	Power supply, 2.3 V ~ 3.6 V
36		GND	Ground

3 Specifications

3.1 Absolute Maximum Ratings

All measurements are referenced at the device pins, unless otherwise indicated. All specifications are over process and voltage, unless otherwise indicated.

Table 3. Absolute Maximum Ratings

Parameters	Condition	Min.	Typ.	Max.	Unit
Supply Voltage	V_{BAT} and V_{IO} （Chip pin: 37, 39, 44）	2.7	3.3	3.6	V
	V_{IO} ~ V_{BAT} (differential) （Chip pin: 10, 54）			0.0	V
Digital Inputs	/	-0.5		V_{IO} + 0.5	V
RF Pins	/	-0.5		2.1	V
Analog Pins (XTAL)	/	-0.5		2.1	V
Operating Temperature	/	-30	+25	+85	℃
Storage Temperature	/	-55	+25	+125	℃

3.2 Recommended Operating Conditions

Over operating free-air temperature range (unless otherwise noted) (1) (2)

Table 4. Recommended Operating Conditions of RF-WM-3220B1 Series

Items	Condition (3) (4)	Min.	Typ.	Max.	Unit
V_{BAT}, V_{IO} (shorted to V_{BAT}) (Chip Pin: 10, 37, 39, 44, 54)	Direct battery connection	2.1	3.3	3.6	V
Ambient Thermal Slew	/	-20	/	20	℃
Human Body Model	HBM		±2000		V
Moisture Sensitivity Level			3		
Charged Device Model			±500		V

Notes:

(1) When operating at an ambient temperature of over 75 °C, the transmit duty cycle must remain below 50% to avoid the auto-protect feature of the power amplifier. If the auto-protect feature triggers, the device takes a maximum of 60 seconds to restart the transmission.

(2) To ensure WLAN performance, ripple on the 2.7 V to 3.3 V supply must be less than ±300 mV.

3.3 RF Parameters

3.3.1 RF Configuration

Wireless Mode	Transmission Rate (Modulation)	Tx Power (Typical)	Rx Sensitivity (Typical)
IEEE802.11 B	11 Mbps @ CCK	17.0 dBm	-82 dBm
IEEE802.11 G	54 Mbps @ OFDM	13.0 dBm	-70 dBm
IEEE802.11 N	HT20 @ MCS7	12.0 dBm	-67 dBm

4 Application, Implementation, and Layout

4.1 Module Photos

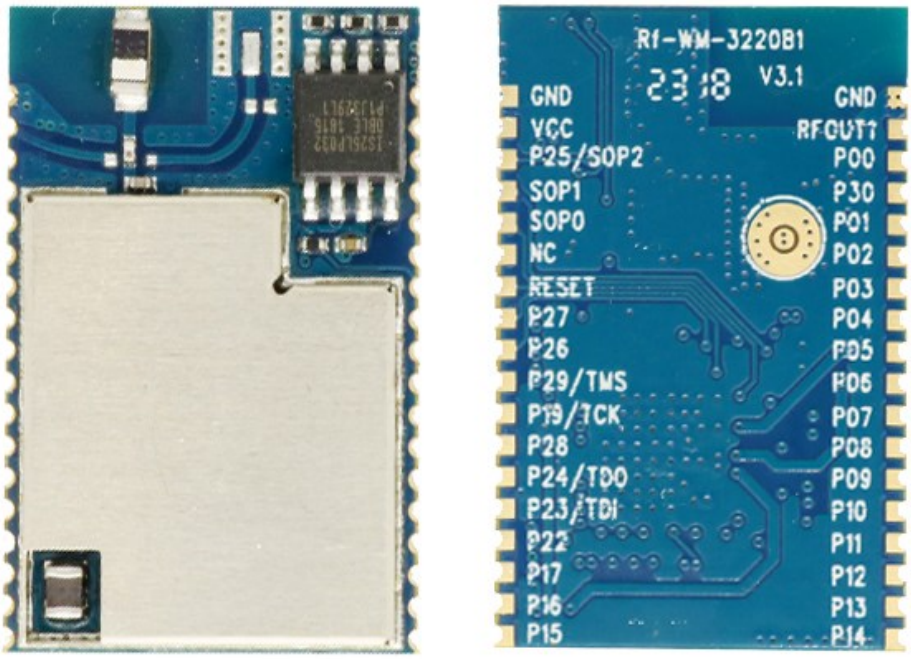


Figure 4. The Photos of RF-WM-3220B1

4.2 Recommended PCB Footprint

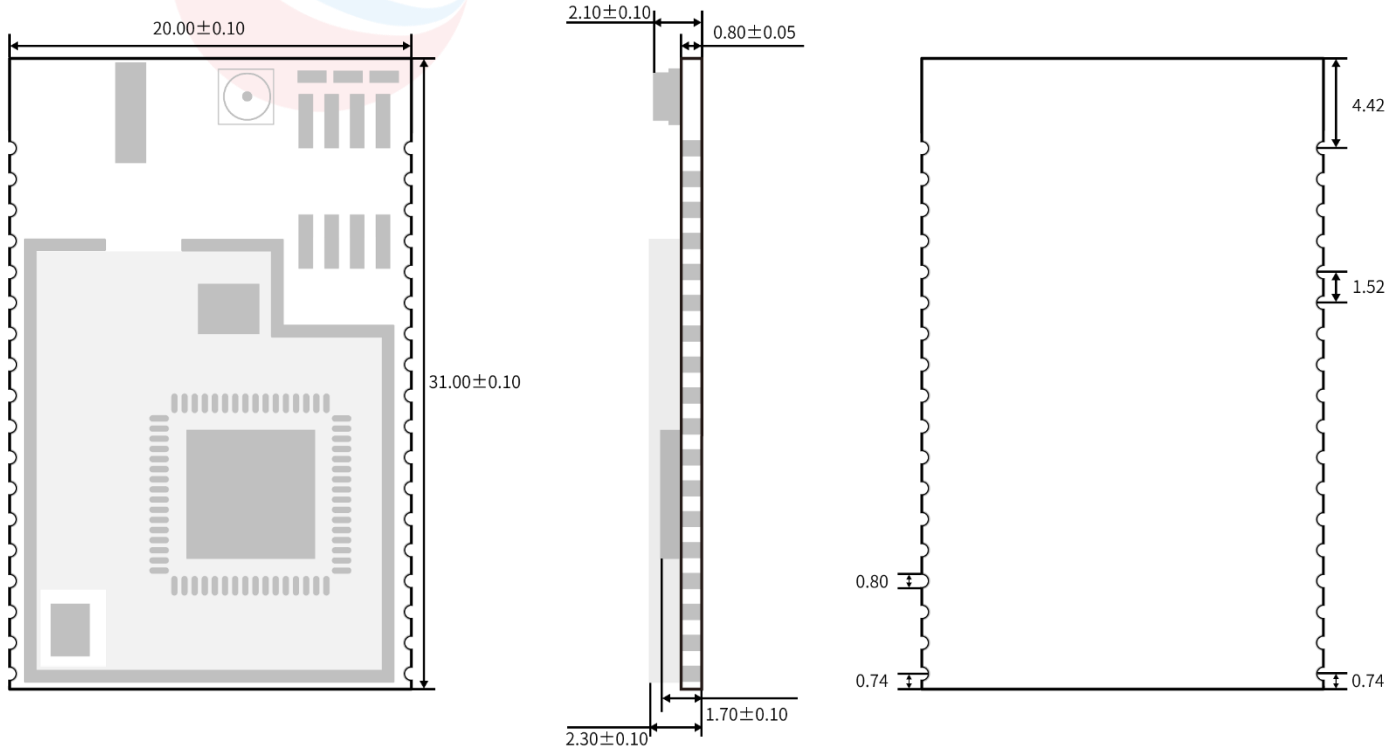


Figure 5. Recommended PCB Footprint of RF-WM-3220B1 (mm)

4.3 Antenna

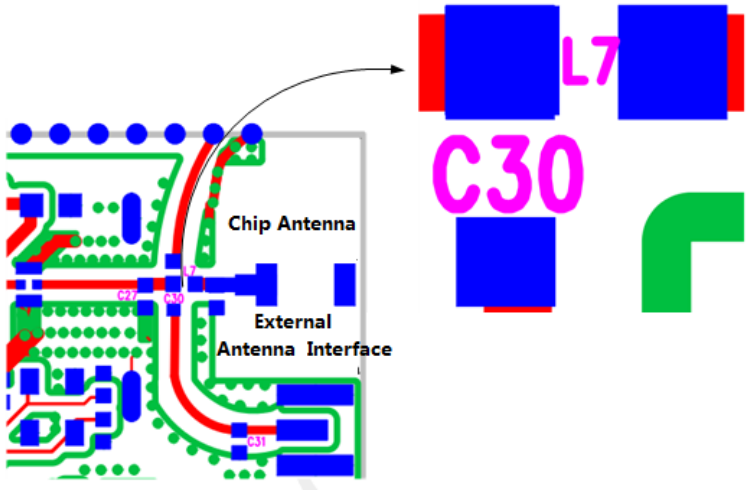


Figure 6. Optional Antenna

Table 5. Optional Antenna Configuration

Parameter / Antenna	C27	C30	C31	L7
Chip Antenna	1 pF	NC	NC	1.8 nH
External Antenna Interface	NC	0 Ω	NC	NC

The module uses the onboard ceramic antenna by default. If you need to use an external antenna, please switch according to the above table.

Note:

NC: Not Connect

C30: When using the external antenna, the position of C30 is measured as 0 Ω according to the actual simulation and debugging.

4.4 Module Operation

4.4.1 SOP Configuration

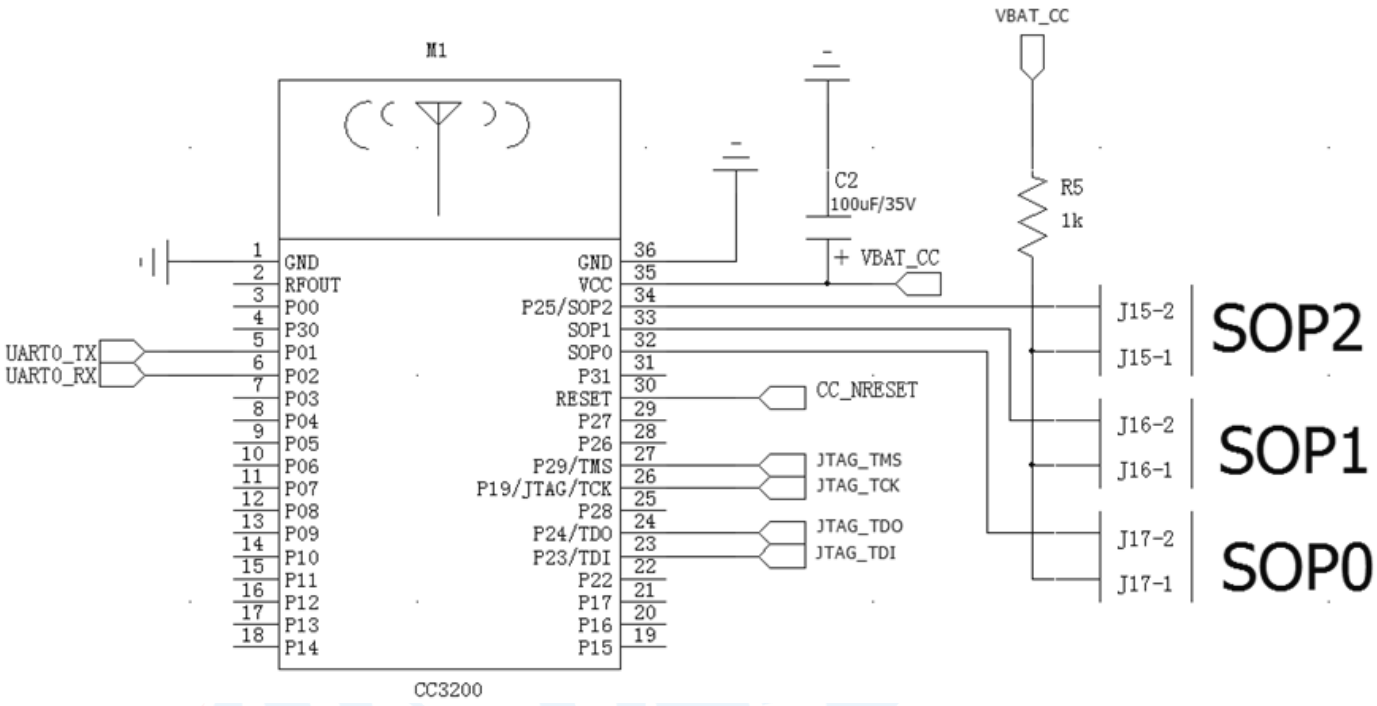


Figure 7. Reference Schematic Diagram of RF-WM-3220B1

Remark:

1) When Pin 1 & 2 of J15 are short connected, and J16 and J17 are disconnected, the module is in flash programming mode. Under this mode, the firmware can be burned into Flash via UART0_TX and UART0_RX.
2) When J15, J16 and J17 are disconnected, the module is in the functional mode + 4 Wire JTAG mode.
3) When Pin 1 & 2 of J17 are shorted connected, and J15 and J16 are disconnected, the module is in Functional mode + 2 Wire JTAG mode.

4.4.2 Module Operation

4.4.2.1 Pin Application Sample

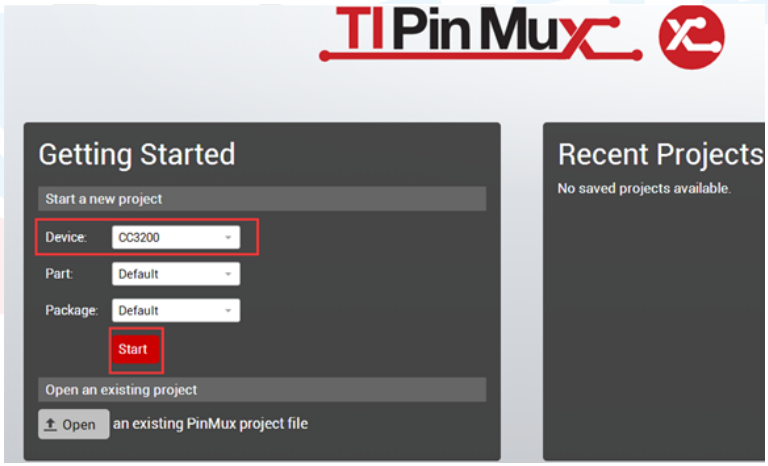
Configure by TI online PinMux tool (https://dev.ti.com/).

When one serial port and two IO ports are needed to be used, pin function table will use for reference to choose the related pins. For example, GPIO3 can work as UART1_TX, GPIO4 as UART1_RX, GPIO2 as normal output port and GPIO5 as normal input port.

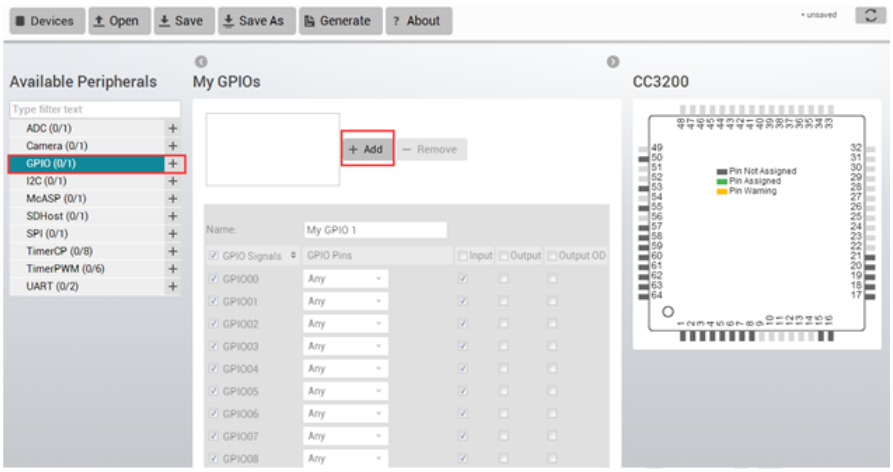
6	57	GPIO02	ADC_CH0
			GPIO2
			UART0_RX
			UART1_RX
			GT_CCP02
7	58	GPIO03	ADC_CH1
			GPIO3
			UART1_TX
			pDATA7(CAM_D3)
8	59	GPIO04	ADC_CH2
			GPIO4
			UART1_RX
			pDATA6(CAM_D2)
9	60	GPIO05	ADC_CH3
			GPIO5
			pDATA5(CAM_D1)
			McAXR1
			GT_CCP05

Figure 8. Pin Application Example of RF-WM-3220B1

The functions of IO ports can be configured flexibly and the program is generated easily by the program “Pin Mux” offered by Texas Instruments.

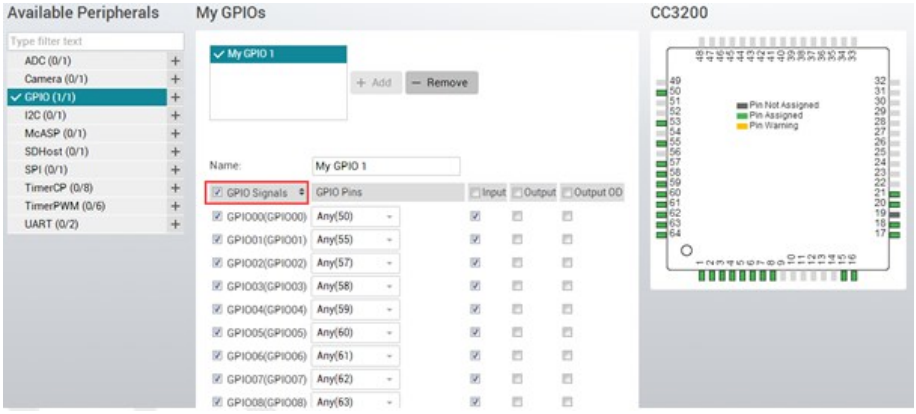


Select “CC3200” as “Device” and click “Start”

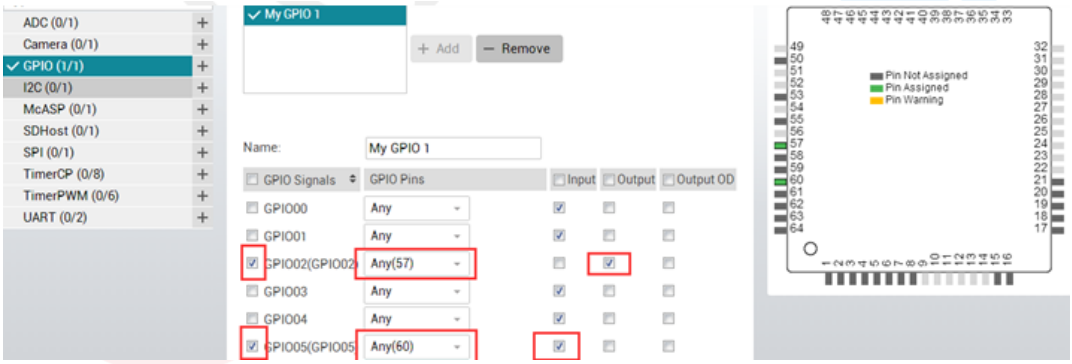


Select “GPIO” and click “+ Add”

Remove the select of “GPIO Signals”

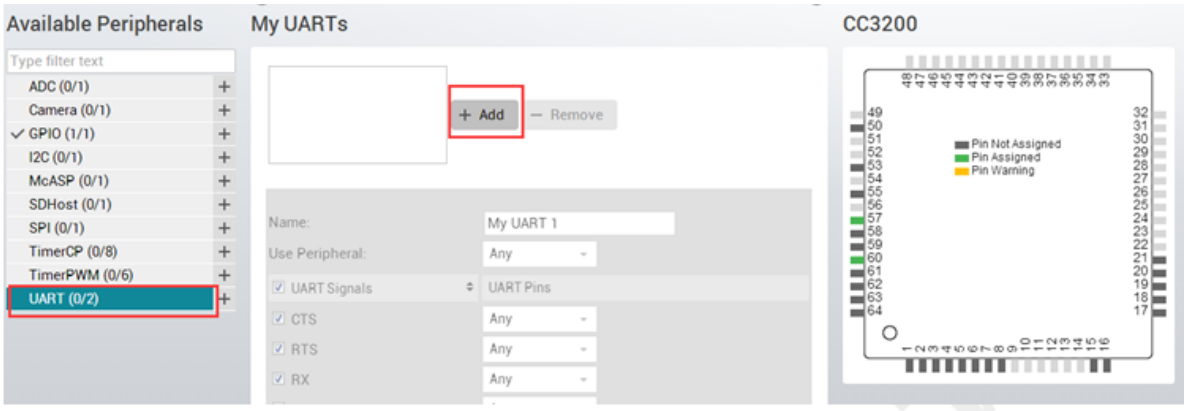


Select “GPIO2” and “GPIO5”, and choose the corresponding IO type

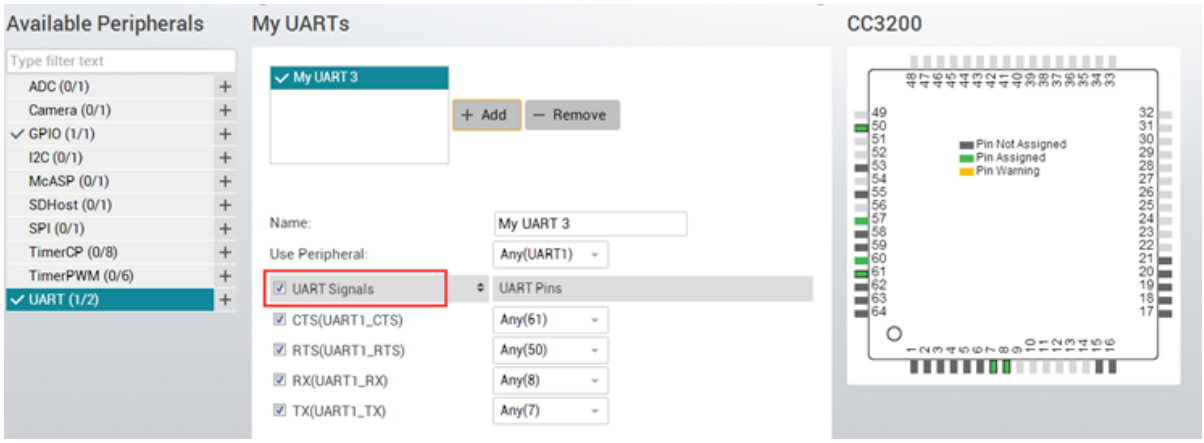


Select “UART” and click “+ Add”

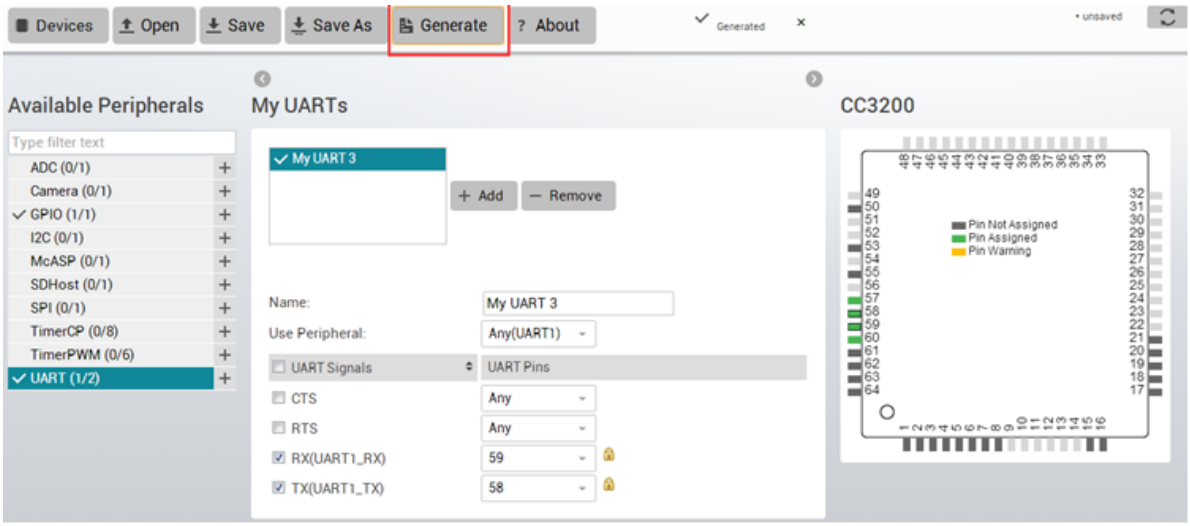
Remove the select of “UART Signals”



As the pin numbers of GPIO03 and GPIO04 are 58 and 59 respectively, just select the corresponding pin as shown.



After configuration is done, click “Generate” to generate .c and .h files. Add the files generated into the corresponding program. All the configuration is done.



4.5 Basic Operation of Hardware Design

1. It is recommended to offer the module with a DC stabilized power supply, a tiny power supply ripple coefficient and the reliable ground. Please pay attention to the correct connection between the positive and negative poles of the power supply. Otherwise, the reverse connection may cause permanent damage to the module;
2. Please ensure the supply voltage is between the recommended values. The module will be permanently damaged if the voltage exceeds the maximum value. Please ensure the stable power supply and no frequently fluctuated voltage.
3. When designing the power supply circuit for the module, it is recommended to reserve more than 30% of the margin, which is beneficial to the long-term stable operation of the whole machine. The module should be far away from the power electromagnetic, transformer, high-frequency wiring and other parts with large electromagnetic interference.

4. The bottom of module should avoid high-frequency digital routing, high-frequency analog routing and power routing. If it has to route the wire on the bottom of module, for example, it is assumed that the module is soldered to the Top Layer, the copper must be spread on the connection part of the top layer and the module, and be close to the digital part of module and routed in the Bottom Layer (all copper is well grounded).
5. Assuming that the module is soldered or placed in the Top Layer, it is also wrong to randomly route the Bottom Layer or other layers, which will affect the spurs and receiving sensitivity of the module to some degrees;
6. Assuming that there are devices with large electromagnetic interference around the module, which will greatly affect the module performance. It is recommended to stay away from the module according to the strength of the interference. If circumstances permit, appropriate isolation and shielding can be done.
7. Assuming that there are routings of large electromagnetic interference around the module (high-frequency digital, high-frequency analog, power routings), which will also greatly affect the module performance. It is recommended to stay away from the module according to the strength of the interference. If circumstances permit, appropriate isolation and shielding can be done.
8. It is recommended to stay away from the devices whose TTL protocol is the same 2.4 GHz and 5 GHz physical layer, for example: USB 3.0.
9. The antenna installation structure has a great influence on the module performance. It is necessary to ensure the antenna is exposed and preferably vertically upward. When the module is installed inside of the case, a high-quality antenna extension wire can be used to extend the antenna to the outside of the case.
10. The antenna must not be installed inside the metal case, which will cause the transmission distance to be greatly weakened.
11. The recommendation of antenna layout.

    The chip antenna position on PCB is free space electromagnetic radiation. The location and layout of antenna is a key factor to increase the data rate and transmission range.

    Therefore, the layout of the module antenna location and routing is recommended as follows:

    （1） Place the antenna on the edge (corner) of the PCB.

    （2） Make sure that there is no signal line or copper foil in each layer below the antenna.

    （3） It is the best to hollow out the antenna position in the following figure ensure that S11 of the module is minimally affected.

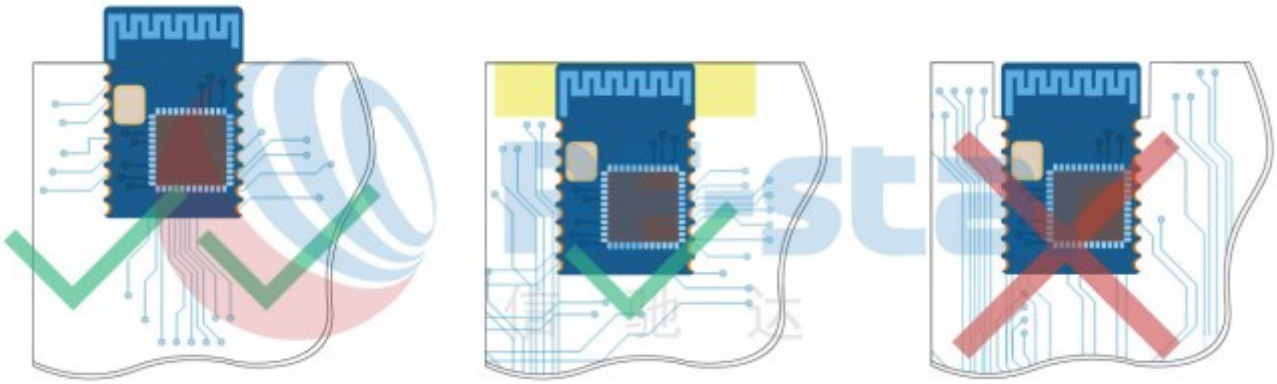


Figure 9. Recommendation of Antenna Layout

Note: The hollow-out position is based on the antenna used.

4.6 Trouble Shooting

4.6.1 Unsatisfactory Transmission Distance

1. When there is a linear communication obstacle, the communication distance will be correspondingly weakened. Temperature, humidity, and co-channel interference will lead to an increase in communication packet loss rate. The performances of ground absorption and reflection of radio waves will be poor, when the module is tested close to the ground.
2. Seawater has a strong ability to absorb radio waves, so the test results by seaside are poor.
3. The signal attenuation will be very obvious, if there is a metal near the antenna or the module is placed inside of the metal shell.
4. The incorrect power register set or the high data rate in an open air may shorten the communication distance. The higher the data rate, the closer the distance.
5. The low voltage of the power supply is lower than the recommended value at ambient temperature, and the lower the voltage, the smaller the power is.
6. The unmatchable antennas and module or the poor quality of antenna will affect the communication distance.

4.6.2 Vulnerable Module

1. Please ensure the supply voltage is between the recommended values. The module will be permanently damaged if the voltage exceeds the maximum value. Please ensure the stable power supply and no frequently fluctuated voltage.
2. Please ensure the anti-static installation and the electrostatic sensitivity of high-frequency devices.
3. Due to some humidity sensitive components, please ensure the suitable humidity during installation and application. If there is no special demand, it is not recommended to use at too high or too low temperature.

4.6.3 High Bit Error Rate

1. There are co-channel signal interferences nearby. It is recommended to be away from the interference sources or modify the frequency and channel to avoid interferences.
2. The unsatisfactory power supply may also cause garbled. It is necessary to ensure the power supply reliability.
3. If the extension wire or feeder wire is of poor quality or too long, the bit error rate will be high.

4.7 Electrostatics Discharge Warnings

The module will be damaged for the discharge of static. RF-star suggest that all modules should follow the 3 precautions below:

1. According to the anti-static measures, bare hands are not allowed to touch modules.
2. Modules must be placed in anti- static areas.
3. Take the anti-static circuitry (when inputting HV or VHF) into consideration in product design.
   Static may result in the degradation in performance of module, even causing the failure.

4.8 Soldering and Reflow Condition

1. Heating method: Conventional Convection or IR/convection.
2. Solder paste composition: Sn96.5 / Ag3.0 / Cu0.5
3. Allowable reflow soldering times: 2 times based on the following reflow soldering profile.
4. Temperature profile: Reflow soldering shall be done according to the following temperature profile.
5. Peak temperature: 245 ℃.

Table 6. Temperature Table of Soldering and Reflow

Profile Feature	Sn-Pb Assembly	Pb-Free Assembly
Solder Paste	Sn63 / Pb37	Sn96.5 / Ag3.0 / Cu0.5
Min. Preheating Temperature (T_{min})	100 ℃	150 ℃
Max. Preheating Temperature (T_{max})	150 ℃	200 ℃
Preheating Time (T_{min} to T_{max}) (t_1)	60 s ~ 120 s	60 s ~ 120 s
Average Ascend Rate (T_{max} to T_p)	Max. 3 ℃/s	Max. 3 ℃/s
Liquid Temperature (T_L)	183 ℃	217 ℃
Time above Liquidus (t_L)	60 s ~ 90 s	30 s ~ 90 s
Peak Temperature (T_p)	220 ℃ ~ 235 ℃	230 ℃ ~ 250 ℃
Average Descend Rate (T_p to T_{max})	Max. 6 ℃/s	Max. 6 ℃/s
Time from 25 ℃ to Peak Temperature (t_2)	Max. 6 minutes	Max. 8 minutes

Time of Soldering Zone (t_P)	20±10 s	20±10 s

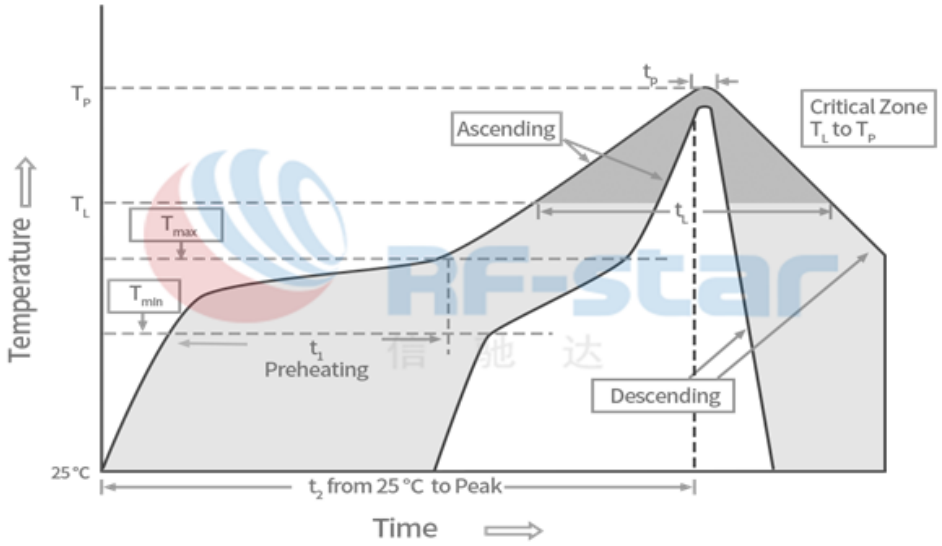


Figure 10. Recommended Reflow for Lead Free Solder

5 Optional Package Specification

The default package method is ***by tray***. If you need the modules to be shipped by tape & reel, pls contact us in advance.

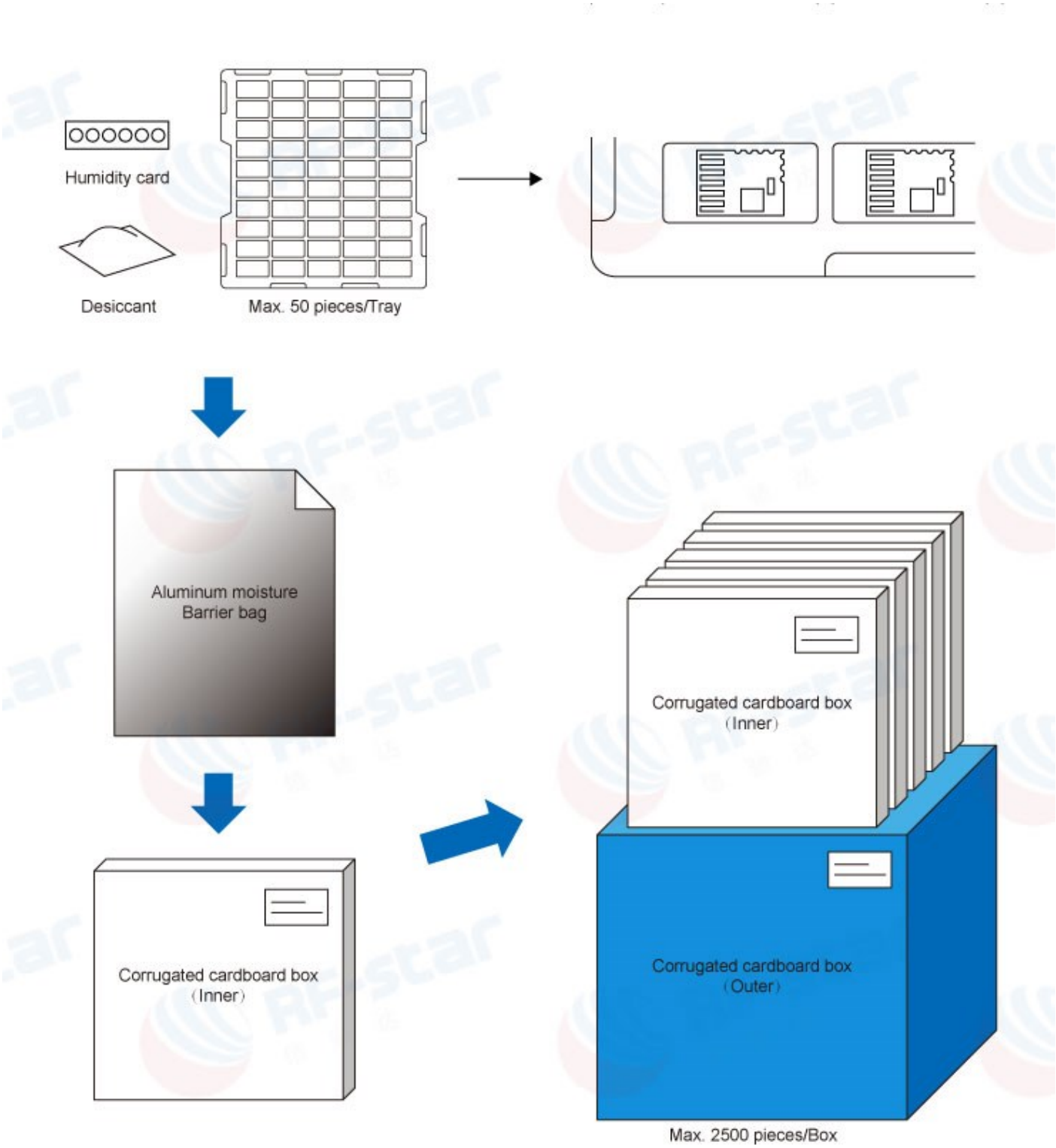


Figure 11. Default Package by Tray

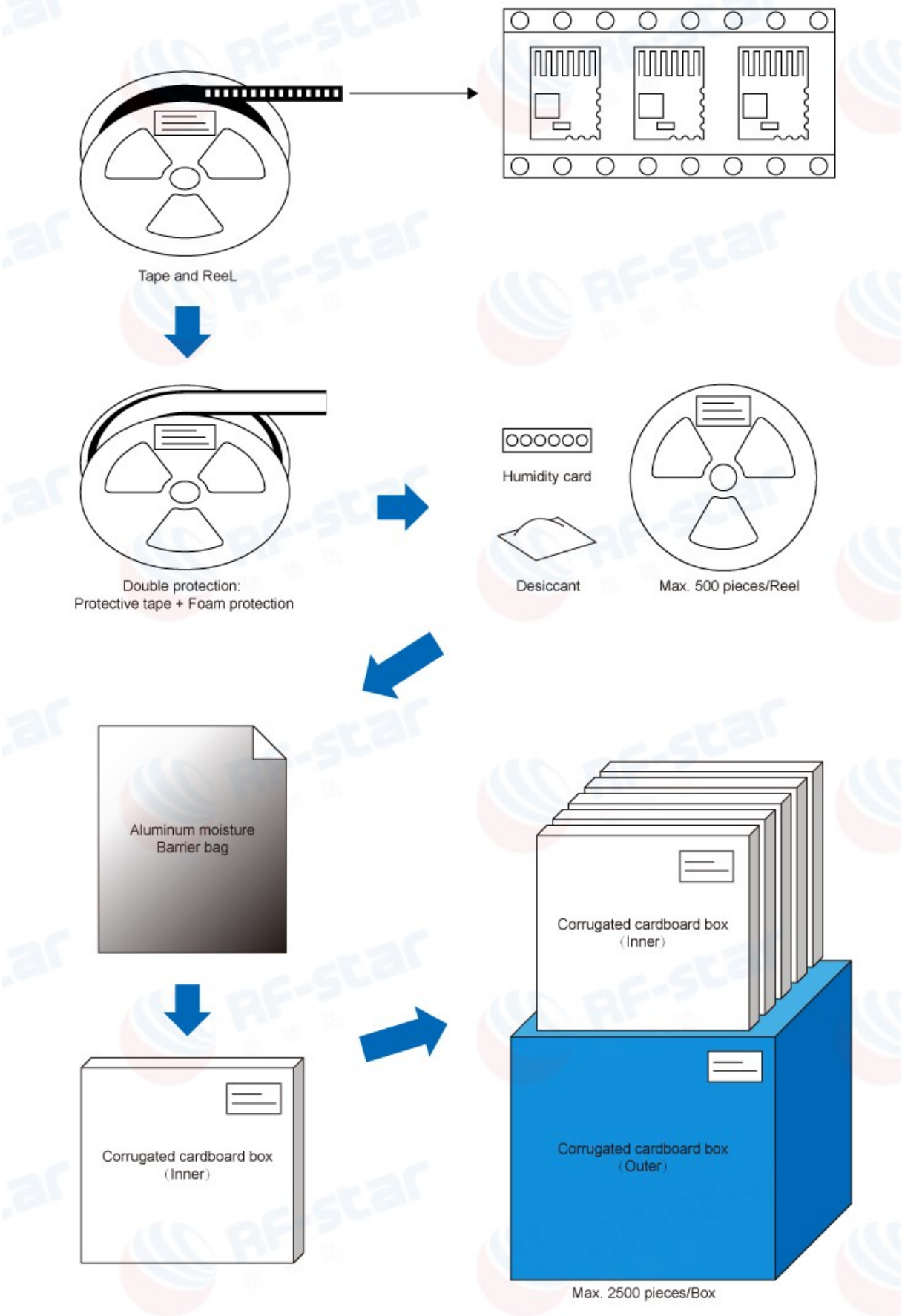


Figure 12. Package by Tape & Reel

5 Certification

5.1 RoHS

RoHS Report No.: ZKS22006701

CERTIFICATE OF CONFORMITY

RoHS Directive 2011/65/EU and (EU) 2015/863

Certificate No.: ZKS22006701

The following product has been tested by Dongguan ZRLK Testing Technology Co., Ltd. as specified complied with the requirements of RoHS Directive 2011/65/EU (RoHS 2.0) & Commission Delegated Directive (EU) 2015/863. It is possible to use CE marking to demonstrate the conformity with the RoHS Directive.

Holder of Certificate	:	Shenzhen RF-star Technology Co., Ltd. Room 601, Block C, Skyworth Building, High-tech Park, Nanshan District, Shenzhen, Guangdong, China
Manufacturer	:	Shenzhen RF-star Technology Co., Ltd. Room 601, Block C, Skyworth Building, High-tech Park, Nanshan District, Shenzhen, Guangdong, China
Sample Name	:	WiFi module
Sample Model	:	RF-WM-3220B1
Trade Name	:	RF-star
Test Methods	:	IEC 62321-3-1:2013, IEC 62321-4:2013/AMD 1:2017, IEC 62321-5:2013, IEC 62321-6:2015, IEC 62321-7-1:2015, IEC 62321-7-2:2017, IEC 62321-8:2017.
Report No.	:	DSP22100409-1

The Declaration is issued after testing of the named product(s) and audit of the technical documentation and confirms that the tested product complies with the essential protection requirements of the mentioned directives on a voluntary basis. The statement is based on a single evaluation of one sample of above-mentioned products.

Certification Body

Frank Fang / General Manager

Date: Oct 31, 2022

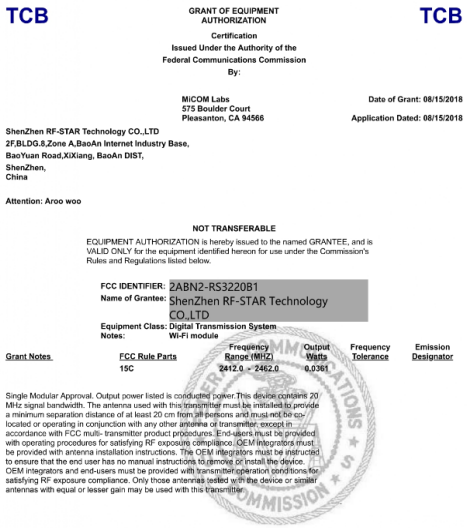
Dongguan ZRLK Testing Technology Co., Ltd
Building 2, No. 1, Technology 10th Road, Songshan Lake Park,
Dongguan City, Guangdong Province.
Tel.: +86-0769-26621775 Fax: +86-0769-26621775 Website: www.zrlklab.com

Figure 13. RoHS Certificate

5.2 FCC

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

FCC Identifier: 2ABN2-RS3220B1



TCB GRANT OF EQUIPMENT AUTHORIZATION TCB

Certification
Issued Under the Authority of the
Federal Communications Commission
By:

MiCOM Labs
575 Boulder Court
Pleasanton, CA 94566

Date of Grant: 08/15/2018
Application Dated: 08/15/2018

ShenZhen RF-STAR Technology CO.,LTD
2F,BLDG.8,Zone A,BaoAn Internet Industry Base,
BaoYuan Road,XiXiang, BaoAn DIST,
ShenZhen,
China

Attention: Aroo woo

NOT TRANSFERABLE

EQUIPMENT AUTHORIZATION is hereby issued to the named GRANTEE, and is VALID ONLY for the equipment identified hereon for use under the Commission's Rules and Regulations listed below.

FCC IDENTIFIER: 2ABN2-RS3220B1
Name of Grantee: ShenZhen RF-STAR Technology CO.,LTD
Equipment Class: Digital Transmission System
Notes: Wi-Fi module

Grant Notes	FCC Rule Parts	Frequency Range (MHz)	Output Watts	Frequency Tolerance	Emission Designator
	15C	2412.0 - 2462.0	0.0361		

Single Modular Approval. Output power listed is conducted power.This device contains 20 MHz signal bandwidth. The antenna used with this transmitter must be installed to provide a minimum separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter, except in accordance with FCC multi- transmitter product procedures. End-users must be provided with operating procedures for satisfying RF exposure compliance. OEM integrators must be provided with antenna installation instructions. The OEM integrators must be instructed to ensure that the end user has no manual instructions to remove or install the device. OEM integrators and end-users must be provided with transmitter operation conditions for satisfying RF exposure compliance. Only those antennas tested with the device or similar antennas with equal or lesser gain may be used with this transmitter.

Figure 14. FCC Certificate

6 Revision History

Date	Version No.	Description
2017.10.20	V1.0	The Initial version is released.
2019.04.29	V1.0	Add “parameter” chapter.
2019.09.20	V1.0	Update company address.
2023.05.25	V1.0	Update MSL level. Update the Shenzhen office address.

Note:

1. The document will be optimized and updated from time to time. Before using this document, please make sure it is the latest version.
2. To obtain the latest document, please download it from the official website: www.rfstariot.com and www.szrfstar.com.

7 Contact Us

SHENZHEN RF-STAR TECHNOLOGY CO., LTD.

Shenzhen HQ:

Add.: Room 502, Podium Building No. 12, Shenzhen Bay Science and Technology Ecological Park, Nanshan District, Shenzhen, Guangdong, China, 518063

Tel.: 86-755-8632 9829

Chengdu Branch:

Add.: N2-1604, Global Center, North No. 1700, Tianfu Avenue, Hi-Tech District, Chengdu, Sichuan, China, 610095

Tel.: 86-28-8692 5399

Email: sunny@szrfstar.com, sales@szrfstar.com

Web.: www.rfstariot.com, www.szrfstar.com