



PRODUCT SPECIFICATION

6221ASRC

Wi-Fi Dual-band 1x1 11ac + Bluetooth 4.2

Combo Module

Version:v2.3

Customer: _____

Customer P/N: _____

Signature: _____

Date: _____

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6221ASRC Module Datasheet

Ordering Information	Part NO.	Description
	FG6221ASRC-OL	RTL8821CS-CG, a/b/g/n/ac, Wi-Fi+BT4.2, 1T1R, 12X12mm, SDIO +Uart, PCB V1.0 (no C33)
	FG6221ASRC-KL	RTL8821CS-CG, a/b/g/n/ac, Wi-Fi+BT4.2, 1T1R, 12X12mm, SDIO +Uart, PCB V1.0 (no C33)(客供 IC)

Target power

2.4G: 16/15/14

5.8G: 13/12/10

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[illegible]

1. General Description

1.1 Introduction

Fn-Link Technology would like to announce a low-cost and low-power consumption module which has all of the Wi-Fi functionalities. It is a highly-integrated IEEE 802.11 a/b/g/n/ac MAC/Baseband/RF WLAN single chip. For Wireless LAN(WLAN)operation. The integrated module provides SDIO interface for Wi-Fi . The module provides simple legacy and 20MHz/40MHz/80MHz co-existence mechanisms to ensure backward and network compatibility

The wireless module complies with IEEE 802.11 a/b/g/n/ac standard and it can achieve up to a speed of 433.3Mbps with single stream in 802.11ac draft to connect to the wireless LAN. The integrated module provides SDIO interface for Wi-Fi, UART / PCM interface for Bluetooth.

This compact module is a total solution for a combination of Wi-Fi + BT technologies.

The module is specifically developed for Smart phones and Portable devices.

1.2 Description

Model Name	6221ASRC
Product Description	Support Wi-Fi/Bluetooth functionalities
Dimension	L x W x T: 12 x 12 x 2.0 (typical) mm
Wi-Fi Interface	Support SDIO V3.0/2.0/1.1
BT Interface	UART / PCM
OS supported	Android /Linux/ Win CE /iOS /XP/WIN7/WIN10
Operating temperature	0°C to 70°C
Storage temperature	-40°C to 85°C

2. Features

General

- Highly integrated wireless local area network(WLAN) system-on-chip (SOC) for 5 GHZ 802.11ac, or 2.4G/5G 802.11n WLAN applications
- Supports 20/40MHz at 2.4GHz and supports 20/40/80MHz at 5GHz
- Supports Bluetooth for class1 and class2 power level transmissions without requiring an external PA

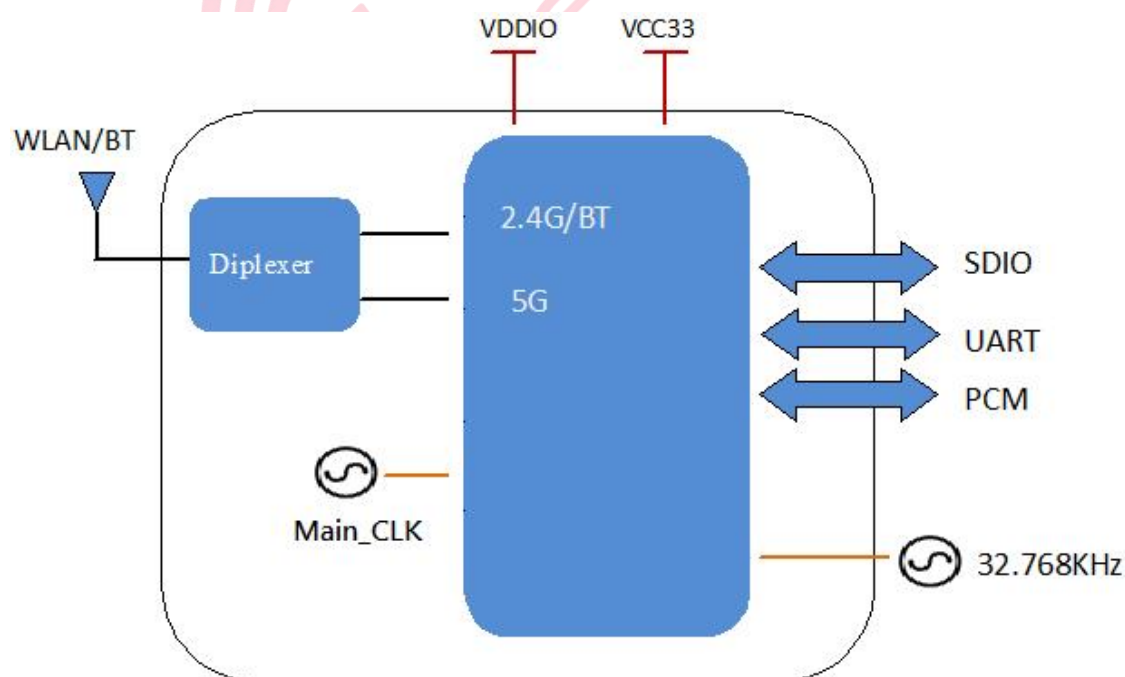
Host Interface

- Supports low power SDIO3.0 interface for WLAN and UART/PCM interface for Bluetooth

Bluetooth Features

- Supports WLAN-Bluetooth coexistence
- Supports Bluetooth V4.2+HS, BLE and be backwards compatible with Bluetooth 1.2, 2.X+ enhance data rate.
- BT host digital interface:
 - HCI UART (up to 4 Mbps)
 - PCM for audio data

3. Block Diagram



4. General Specification

4.1 2.4GHz WI-FI Specification

Feature	Description	
WLAN Standard	IEEE 802.11 b/g/n Wi-Fi compliant	
Frequency Range	2.400 GHz ~ 2.4835 GHz (2.4 GHz ISM Band)	
Number of Channels	2.4GHz: Ch1 ~ Ch14	
Modulation	DBPSK/DQPSK/CCK(DSSS)、BPSK/QPSK/16QAM/64QAM(OF DM)	
Test Items	Typical Value	EVM
Output Power ¹	802.11b /11Mbps : 16dBm ± 1.5 dB	EVM ≤ -9dB
	802.11g /54Mbps : 15dBm ± 1.5 dB	EVM ≤ -25dB
	802.11n /MCS7(HT 20): 14dBm ± 1.5 dB	EVM ≤ -28dB
	802.11n /MCS7(HT 40): 14 dBm ± 1.5 dB	EVM ≤ -28dB
Spectrum Mask	Meet with IEEE standard	
Freq. Tolerance	± 20ppm	
Receive Sensitivity (11b,20MHz) @8% PER	- 1Mbps PER @ -94 dBm	≤-83
	- 2Mbps PER @ -88 dBm	≤-80
	- 5.5Mbps PER @ -86 dBm	≤-79
	- 11Mbps PER @ -85 dBm	≤-76
Receive Sensitivity (11g,20MHz) @10% PER	- 6Mbps PER @ -88 dBm	≤-85
	- 9Mbps PER @ -86 dBm	≤-84
	- 12Mbps PER @ -85 dBm	≤-82
	- 18Mbps PER @ -83 dBm	≤-80
	- 24Mbps PER @ -81 dBm	≤-77
	- 36Mbps PER @ -78 dBm	≤-73
	- 48Mbps PER @ -74 dBm	≤-69
	- 54Mbps PER @ -72 dBm	≤-68
Receive Sensitivity (11n,20MHz) @10% PER	- MCS=0 PER @ -87 dBm	≤-85
	- MCS=1 PER @ -83 dBm	≤-82
	- MCS=2 PER @ -82 dBm	≤-80
	- MCS=3 PER @ -78 dBm	≤-77
	- MCS=4 PER @ -75 dBm	≤-73
	- MCS=5 PER @ -73 dBm	≤-69
	- MCS=6 PER @ -70 dBm	≤-68
	- MCS=7 PER @ -69 dBm	≤-67
Receive Sensitivity	- MCS=0 PER @ -87 dBm	≤-82

(11n,40MHz) @10% PER	- MCS=1	PER @ -83 dBm	≤-79
	- MCS=2	PER @ -82 dBm	≤-77
	- MCS=3	PER @ -78 dBm	≤-74
	- MCS=4	PER @ -74 dBm	≤-70
	- MCS=5	PER @ -70 dBm	≤-66
	- MCS=6	PER @ -68 dBm	≤-65
	- MCS=7	PER @ -67 dBm	≤-64

4.2 5GHz WI-FI Specification

Feature	Description	
WLAN Standard	IEEE 802.11a/n/ac, Wi-Fi compliant	
Frequency Range	5.150 GHz ~ 5.850 GHz (5.0 GHz ISM Band)	
Number of Channels	5.0GHz: Please see the table1	
Modulation	802.11a/n : 64-QAM,16-QAM, QPSK, BPSK 802.11ac : 256-QAM, 64-QAM,16-QAM, QPSK, BPSK	
Test Items	Typical Value	EVM
Output Power ²	802.11a /54Mbps : 13 dBm ± 1.5 dB	EVM ≤ -25dB
	802.11n /MCS7(HT20) : 12 dBm ± 1.5 dB	EVM ≤ -28dB
	802.11n /MCS7(HT40) : 12 dBm ± 1.5 dB	EVM ≤ -28dB
	802.11ac/MCS8(VHT20) : 11 dBm ± 1.5 dB	EVM ≤ -30dB
	802.11ac/MCS7(VHT40) : 12 dBm ± 1.5 dB	EVM ≤ -30dB
	802.11ac/MCS9(VHT40) : 10 dBm ± 1.5 dB	EVM ≤ -32dB
	802.11ac/MCS9(VHT80) : 10 dBm ± 1.5 dB	EVM ≤ -32dB
Test Items	Typical Value	Standard Value
Receive Sensitivity (11a,20MHz) @10% PER	- 6Mbps PER @ -87 dBm	≤-82
	- 9Mbps PER @ -85 dBm	≤-81
	- 12Mbps PER @ -84 dBm	≤-79
	- 18Mbps PER @ -82 dBm	≤-77
	- 24Mbps PER @ -78 dBm	≤-74
	- 36Mbps PER @ -75 dBm	≤-70
	- 48Mbps PER @ -70 dBm	≤-66
	- 54Mbps PER @ -69 dBm	≤-65
Receive Sensitivity	- MCS=0 PER @ -85 dBm	≤-82

(11n,20MHz) @10% PER	- MCS=1	PER @ -83 dBm	≤-79
	- MCS=2	PER @ -80 dBm	≤-77
	- MCS=3	PER @ -77 dBm	≤-74
	- MCS=4	PER @ -73 dBm	≤-70
	- MCS=5	PER @ -69 dBm	≤-66
	- MCS=6	PER @ -67 dBm	≤-65
	- MCS=7	PER @ -66 dBm	≤-64
Receive Sensitivity (11n,40MHz) @10% PER	- MCS=0	PER @ -82 dBm	≤-81
	- MCS=1	PER @ -79 dBm	≤-78
	- MCS=2	PER @ -78 dBm	≤-76
	- MCS=3	PER @ -73 dBm	≤-72
	- MCS=4	PER @ -70 dBm	≤-69
	- MCS=5	PER @ -65 dBm	≤-64
	- MCS=6	PER @ -64 dBm	≤-63
Receive Sensitivity (11ac,20MHz)@10% PER	- MCS=7	PER @ -62 dBm	≤-61
	- MCS=0	PER @ -86 dBm	≤-82
	- MCS=1	PER @ -84 dBm	≤-81
	- MCS=2	PER @ -81 dBm	≤-79
	- MCS=3	PER @ -78 dBm	≤-74
	- MCS=4	PER @ -74 dBm	≤-71
	- MCS=5	PER @ -70 dBm	≤-67
	- MCS=6	PER @ -68 dBm	≤-66
	- MCS=7	PER @ -67 dBm	≤-61
Receive Sensitivity (11ac,40MHz) @10% PER	- MCS=8	PER @ -63 dBm	≤-59
	- MCS=0	PER @ -82 dBm	≤-79
	- MCS=1	PER @ -78 dBm	≤-76
	- MCS=2	PER @ -76 dBm	≤-73
	- MCS=3	PER @ -73 dBm	≤-69
	- MCS=4	PER @ -70 dBm	≤-68
	- MCS=5	PER @ -65 dBm	≤-64
	- MCS=6	PER @ -63 dBm	≤-63
	- MCS=7	PER @ -61 dBm	≤-58
	- MCS=8	PER @ -59 dBm	≤-56
Receive Sensitivity (11ac,80MHz) @10% PER	- MCS=9	PER @ -58 dBm	≤-54
	- MCS=0	PER @ -78 dBm	≤-76
	- MCS=1	PER @ -75 dBm	≤-73
	- MCS=2	PER @ -73 dBm	≤-71

- MCS=3	PER @ -69 dBm	≤-68
- MCS=4	PER @ -66 dBm	≤-64
- MCS=5	PER @ -64 dBm	≤-60
- MCS=6	PER @ -60 dBm	≤-59
- MCS=7	PER @ -58 dBm	≤-58
- MCS=8	PER @ -55 dBm	≤-53
- MCS=9	PER @ -54 dBm	≤-51

NOTES:1.Module have calibrated MCS7 HT40 rate power,other rates control by driver;

2.Module have calibrated MCS7 HT40 /11M rate power, other rats control by driver;

15GHz Channel table

Band (GHz)	Operating Channel Numbers	Channel center frequencies(MHz)
5150MHz~5250MHz	36	5180
	40	5200
	44	5220
	48	5240
5250MHz~5350MHz	52	5260
	56	5280
	60	5300
	64	5320
5470MHz~5725MHz	100	5500
	104	5520
	108	5540
	112	5560
	116	5580
	120	5600
	124	5620
	128	5640
	132	5660
	136	5680
5725MHz~5850MHz	140	5700
	149	5745
	153	5765
	157	5785
	161	5805
	165	5825

4.3 Bluetooth Specification

Feature	Description
General Specification	
Bluetooth Standard	BDR,EDR(1Mbps & 2Mbps & 3Mbps),LE(1Mbps)
Host Interface	UART
Frequency Band	2400 MHz ~ 2483.5 MHz
Number of Channels	79 channels for classic,40 channels for BLE
Modulation	GFSK, $\pi/4$ -DQPSK,8DPSK
RF Specification	
Output Power , tolerance ± 3 dB	
	CL1(dBm)
BDR Output Power	5
EDR Output Power	5
BLE Output Power	5
Sensitivity, tolerance : /	
Sensitivity @ BER=0.1% for GFSK (1Mbps)	-85
Sensitivity @ BER=0.01% for $\pi/4$ -DQPSK (2Mbps)	-85
Sensitivity @ BER=0.01% for 8DPSK (3Mbps)	-85
Sensitivity @ BLE=30.8% for LE (1Mbps)	-85
Maximum Input Level	GFSK (1Mbps):-20dBm
	$\pi/4$ -DQPSK (2Mbps) :-20dBm
	8DPSK (3Mbps) :-20dBm

5. ID setting information

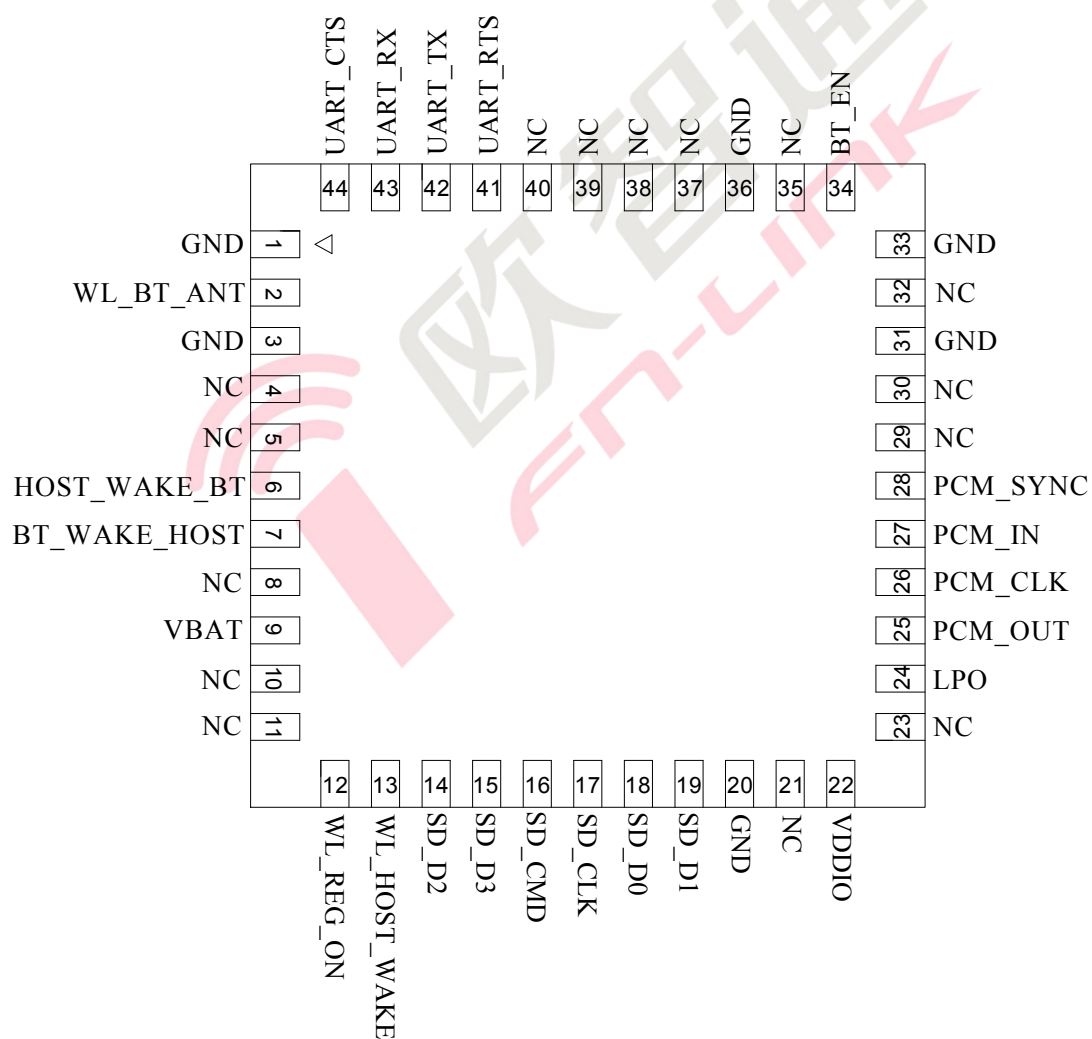
WI-FI

Vendor ID	024C
Product ID	C821

6. Pin Definition

6.1 Pin Outline

< TOP VIEW



6.2 Pin Definition details

NO.	Name	Type	Description	Voltage
1	GND	—	Ground connections	
2	WL_BT_ANT	I/O	RF I/O port	
3	GND	—	Ground connections	
4	NC	—	Floating (Don't connected to ground)	
5	NC	—	Floating (Don't connected to ground)	
6	HOST_WAKE_BT	I	HOST to wake-up Bluetooth device	VDDIO
7	BT_WAKE_HOST	O	Bluetooth device to wake-up HOST	VDDIO
8	NC	—	Floating (Don't connected to ground)	
9	VBAT	P	Main power voltage source input 3.3V	3.3V
10	NC	—	Floating (Don't connected to ground)	
11	NC	—	Floating (Don't connected to ground)	
12	WL_REG_ON	I	Enable pin for WLAN device ON: pull high ; OFF: pull low	VDDIO
13	WL_HOST_WAKE	O	WLAN to wake-up HOST	VDDIO
14	SD_D2	I/O	SDIO data line 2	1.8V or 3.3V
15	SD_D3	I/O	SDIO data line 3	1.8V or 3.3V
16	SD_CMD	I/O	SDIO command line	1.8V or 3.3V
17	SD_CLK	I/O	SDIO clock line	1.8V or 3.3V
18	SD_D0	I/O	SDIO data line 0	1.8V or 3.3V
19	SD_D1	I/O	SDIO data line 1	1.8V or 3.3V
20	GND	—	Ground connections	
21	NC	—	Floating (Don't connected to ground)	
22	VDDIO	P	I/O Voltage supply input	1.8V or 3.3V
23	NC	—	Floating (Don't connected to ground)	
24	LPO	I	External Low Power Clock input (32.768KHz)	
25	PCM_OUT	O	PCM Data output	VDDIO
26	PCM_CLK	I/O	PCM clock	VDDIO
27	PCM_IN	I	PCM data input	VDDIO
28	PCM_SYNC	I/O	PCM sync signal	VDDIO
29	NC	—	Floating (Don't connected to ground)	
30	NC	—	Floating (Don't connected to ground)	
31	GND	—	Ground connections	
32	NC	—	Floating (Don't connected to ground)	

33	GND	—	Ground connections	
34	BT_EN	I	Enable pin for Bluetooth device ON: pull high ; OFF: pull low	VDDIO
35	NC	—	Floating (Don't connected to ground)	
36	GND	—	Ground connections	
37	NC	—	Floating (Don't connected to ground)	
38	NC	—	Floating (Don't connected to ground)	
39	NC	—	Floating (Don't connected to ground)	
40	NC	—	Floating (Don't connected to ground)	
41	UART_RTS	O	Bluetooth UART interface	1.8V or 3.3V
42	UART_TX	O	Bluetooth UART interface	1.8V or 3.3V
43	UART_RX	I	Bluetooth UART interface	1.8V or 3.3V
44	UART_CTS	I	Bluetooth UART interface	1.8V or 3.3V

P:POWER I:INPUT O:OUTPUT VDDIO:1.8V ~ 3.3V

7. Electrical Specifications

7.1 Recommended Operating Rating

		Min.	Typ.	Max.	Unit
Operating Temperature		0	25	70	deg.C
VCC33		3.0	3.3	3.6	V
VDDIO		1.7	1.8 or 3.3	3.6	V
Power Consumption		VCC33 = 3.3V(Unit:mA)			
	Wi-Fi on Mode	68			
	TX (2.4G HT20)	217			
	RX (2.4G HT20)	108			
	TX (5G HT40)	252			
	RX (5G HT40)	115			
	BT on	19			

7.2 Interface Circuit time series

7.2.1 SDIO Pin Description

The module supports SDIO version 3.0 .

SDIO Pin Description

SD 4-Bit Mode	
DATA0	Data Line 0
DATA1	Data Line 1 or Interrupt
DATA2	Data Line 2 or Read Wait
DATA3	Data Line 3
CLK	Clock
CMD	Command Line

7.2.2 SDIO Timing Diagram

For timing criteria, please check specification in “SD specification Part1 Physical Layer Specification Version 3.01”

7.3 System Power Sequence

7.3.1 System Power On Sequence

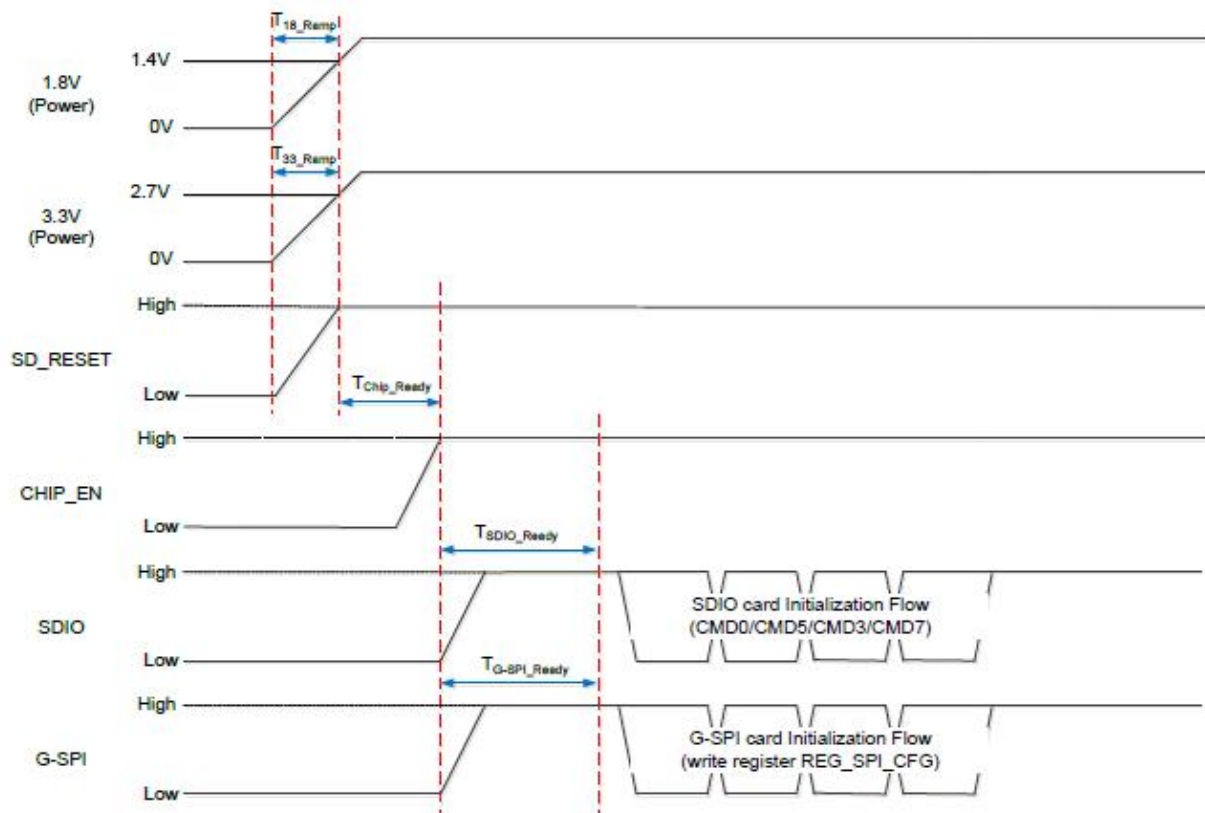


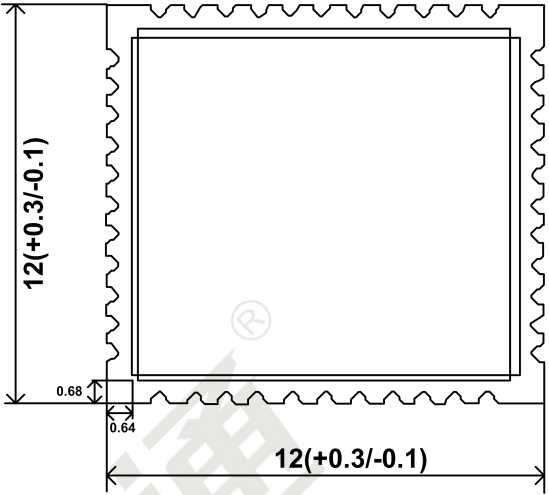
Figure 5. System Power-On Sequence

Table 18. System Power On Timing Parameters

	Min	Typical	Max	Unit	Description
T_{18_Ramp}	0.1	0.5	2.5	ms	The 1.8V main power ramp up duration.
T_{33_Ramp}	0.1	0.5	2.5	ms	The 3.3V main power ramp up duration.
T_{Chip_Ready}					CHIP_EN pull high timing
T_{SDIO_Ready}	1	2	10	ms	SDIO Not Ready Duration. In this state, the RTL8821CS-VI may respond to commands without the ready bit being set. After the ready bit is set, the host will initiate complete card detection procedure.
T_{G-SPI_Ready}	3	4	18	ms	The duration G-SPI device internal initialization. After T_{G-SPI_Ready} , SPI host can then send command to write
					REG_SPI_CFG register. REG_SPI_CFG register is to control G-SPI endian and word length.

8. Size reference

8.1 Module Picture

L x W : 12 x 12 (+0.3/-0.1) mm	
H: 2.0(±0.2) mm	
Weight	0.52g

8.2 Marking Description

< TOP VIEW >



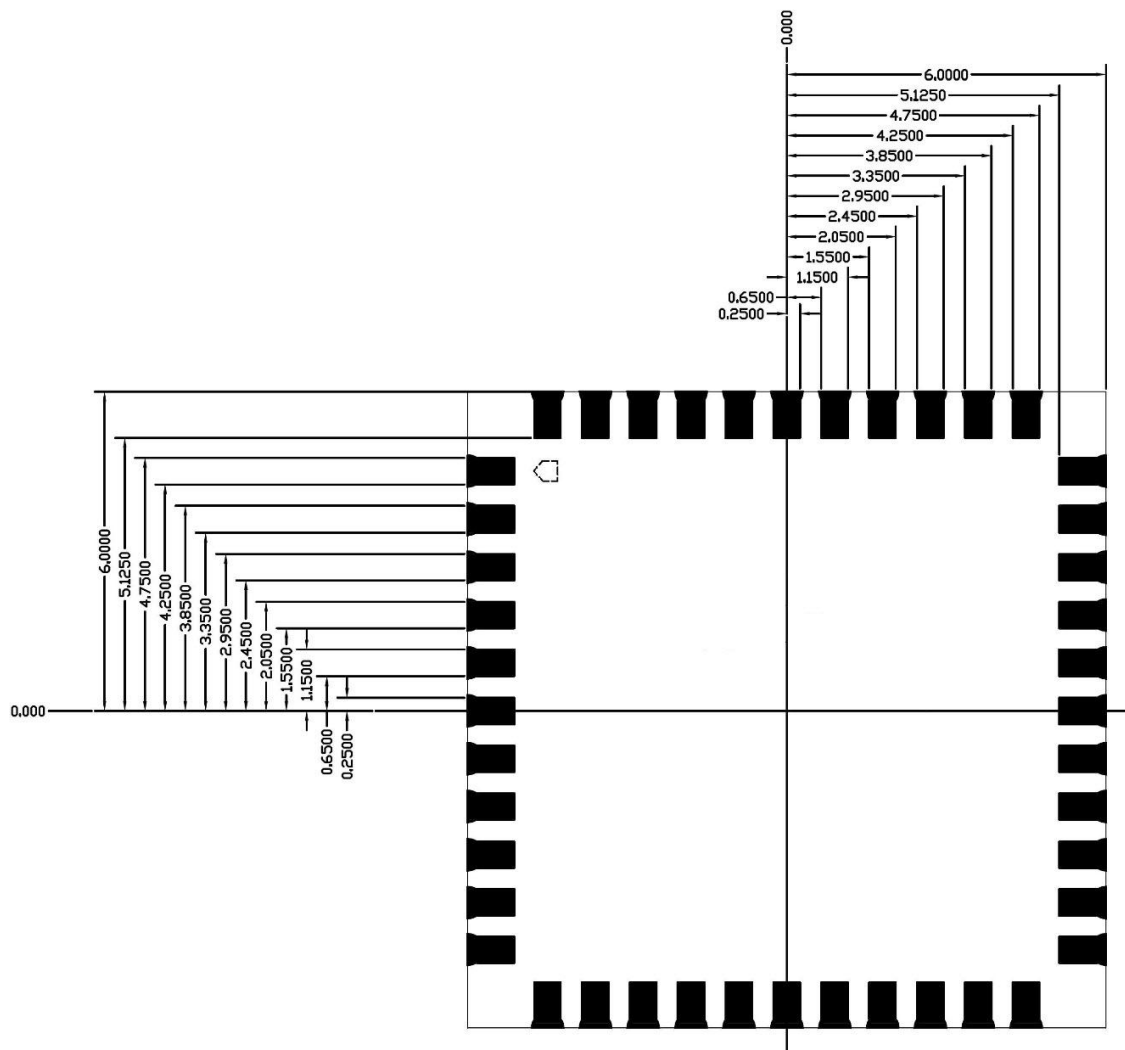
NOTE: datacode '0L' is P/N: FG6221ASRC-0L
datacode 'KL' is P/N: FG6221ASRC-KL

8.3 List of certified information

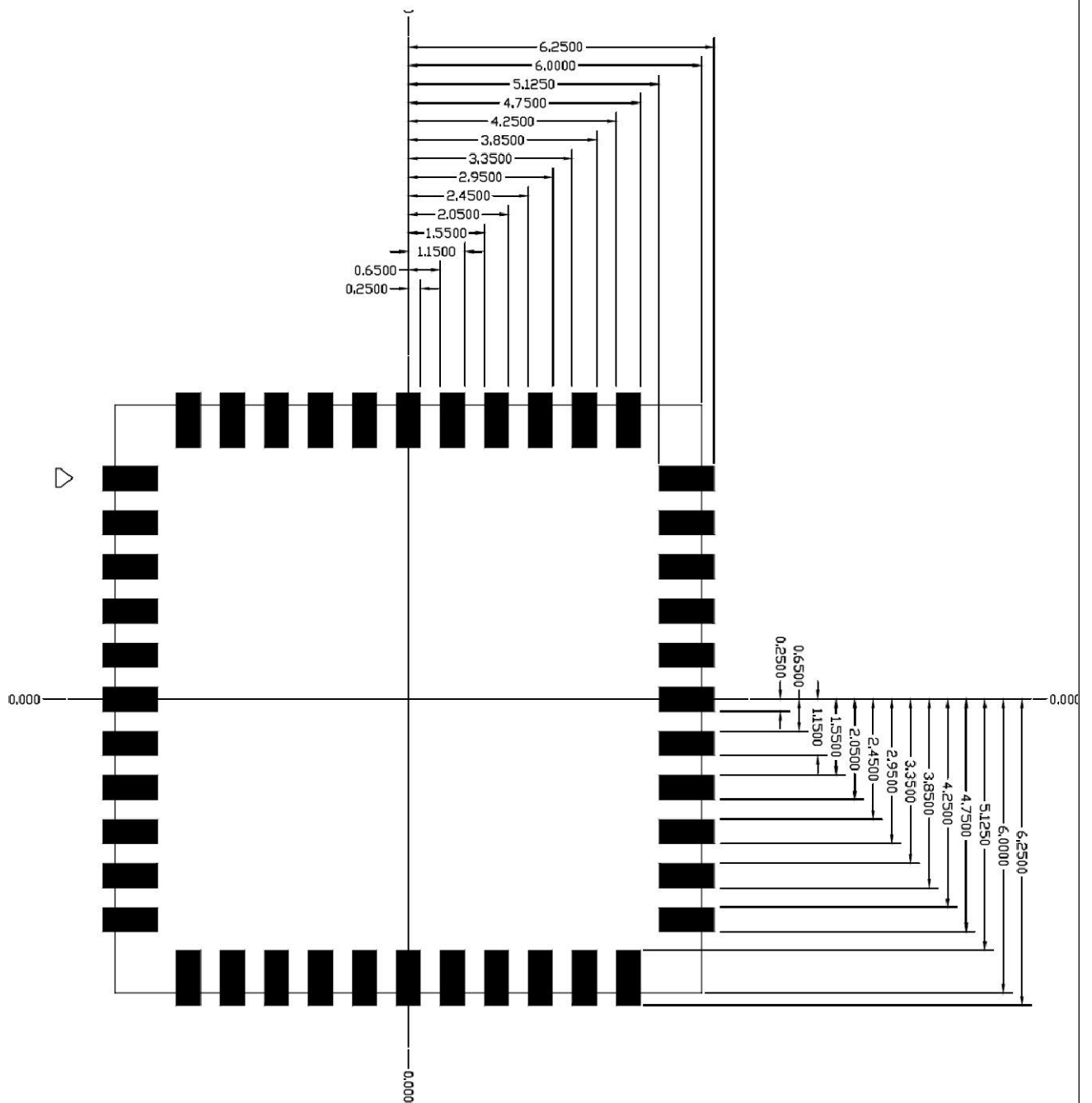
Certification project	Certificate number
SRRC	TBD
FCC	TBD
CE	1622-RED-220038
IC	TBD
NCC	TBD
KCC	TBD
TELEC	TBD
Brazil	TBD
Argentina	TBD
Japan	TBD

8.4 Physical Dimensions

<TOP View>



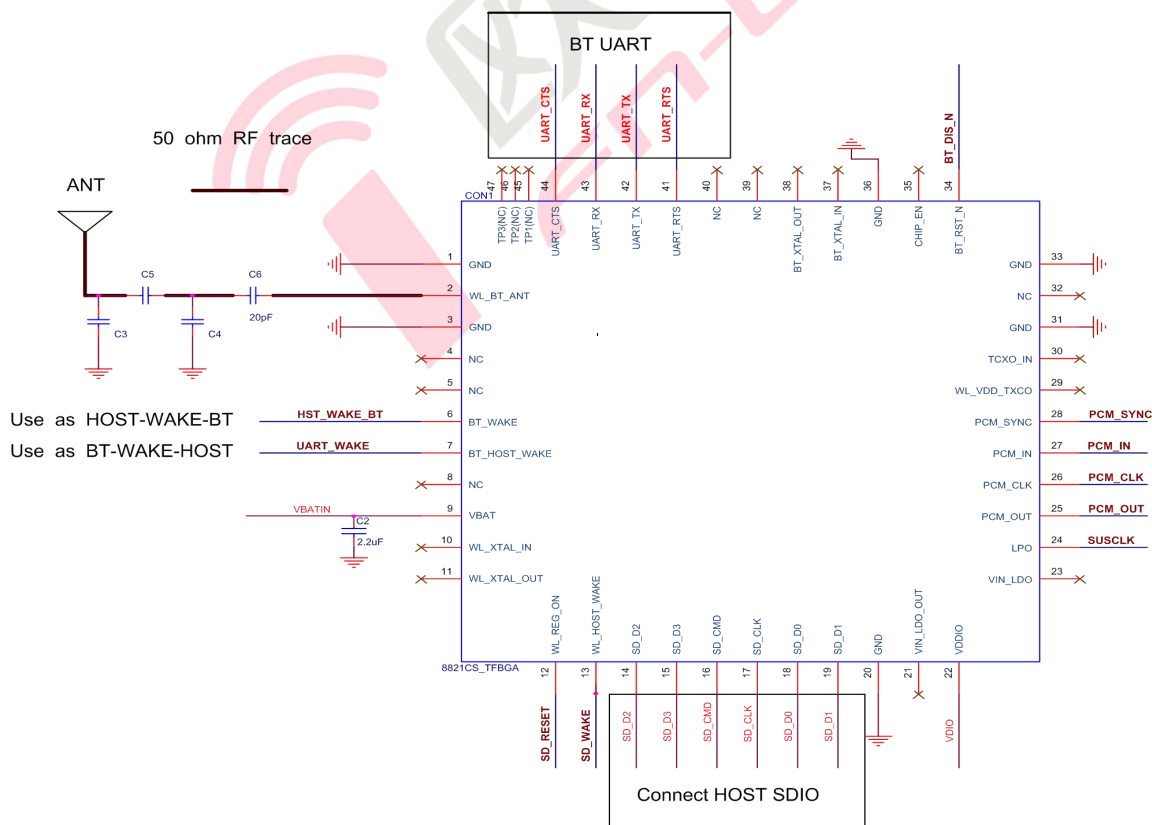
8.5 Layout Recommendation



9. The Key Material List

Inductor	2016,2.2UH,±20%,1200mA	Microgate, cenke, sunlord, ceaiya, GK, c hilisin
Shielding	6221A-SRC V2.0 Shield cover, copper	Suntech, JLitong, 卓益
diplexer	DP1005, 2.4G+5G, diplexer	ACX, Walsin, Murata, Glead, TDK
Crystal	40MHz, 2016, 15pF, 10ppm	Hosonic, ECEC, TKD, JWT
Chipset	RTL8821CS-CG	Realtek
TVS	0201, 4V, 0.05pF ESD±15KV	muRata, Wayon, sunlord
PCB	6221A-SRC-V1.0, green, 4L, 12x12x0.5mm	Sunlord, kx-pcb, brainpower-pcb, truly, SL-pcb

10. Reference Design

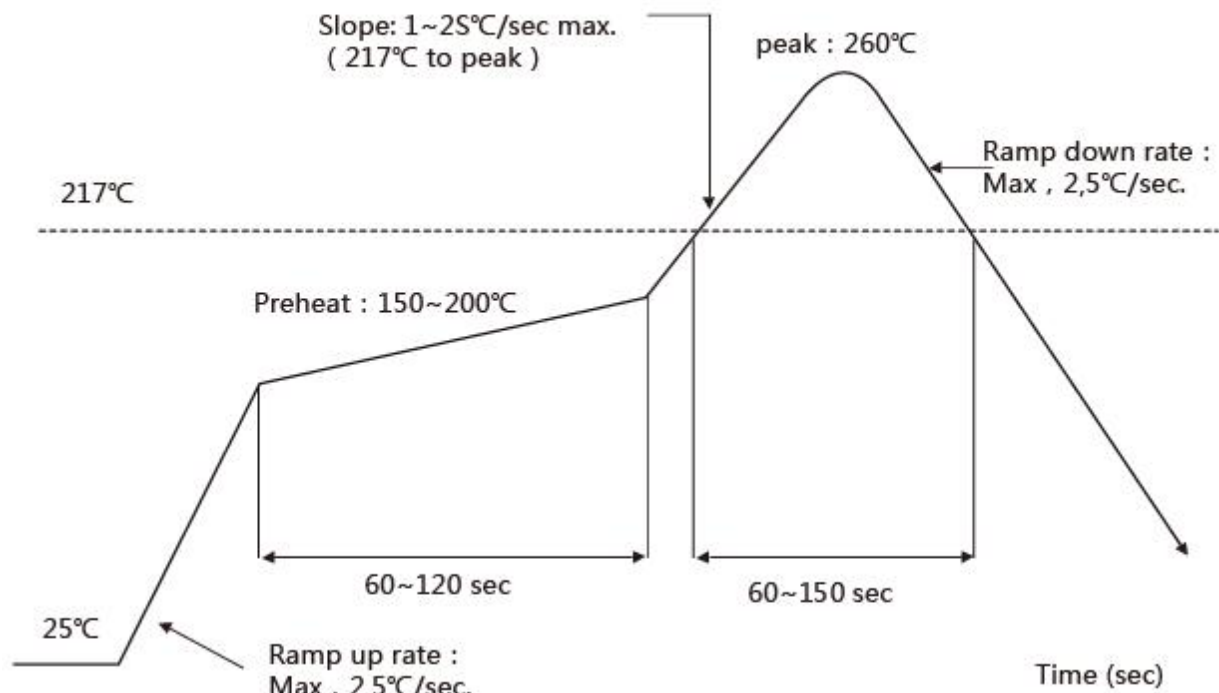


11. Recommended Reflow Profile

Referred to IPC/JEDEC standard.

Peak Temperature : $<260^{\circ}\text{C}$

Number of Times : ≤ 2 times



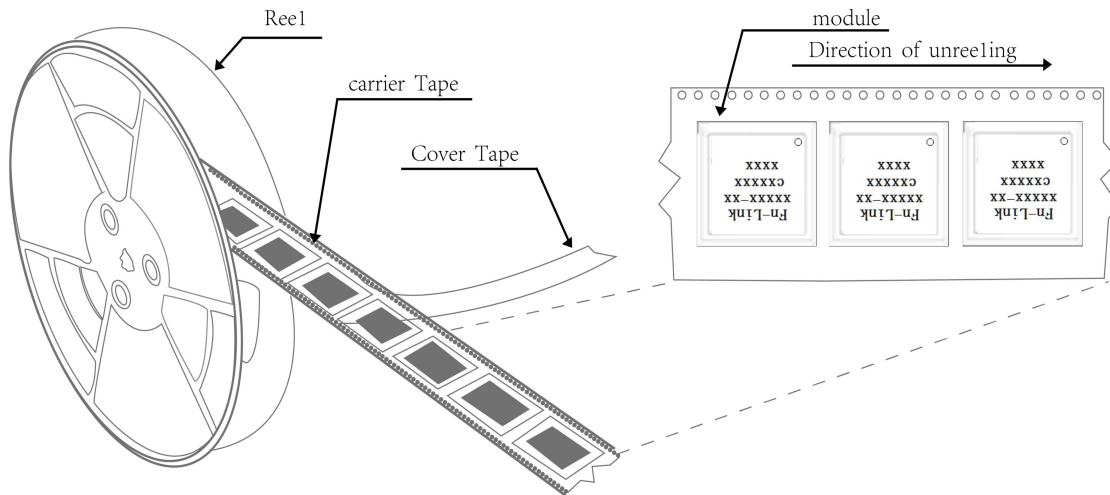
12. RoHS compliance

All hardware components are fully compliant with EU RoHS directive

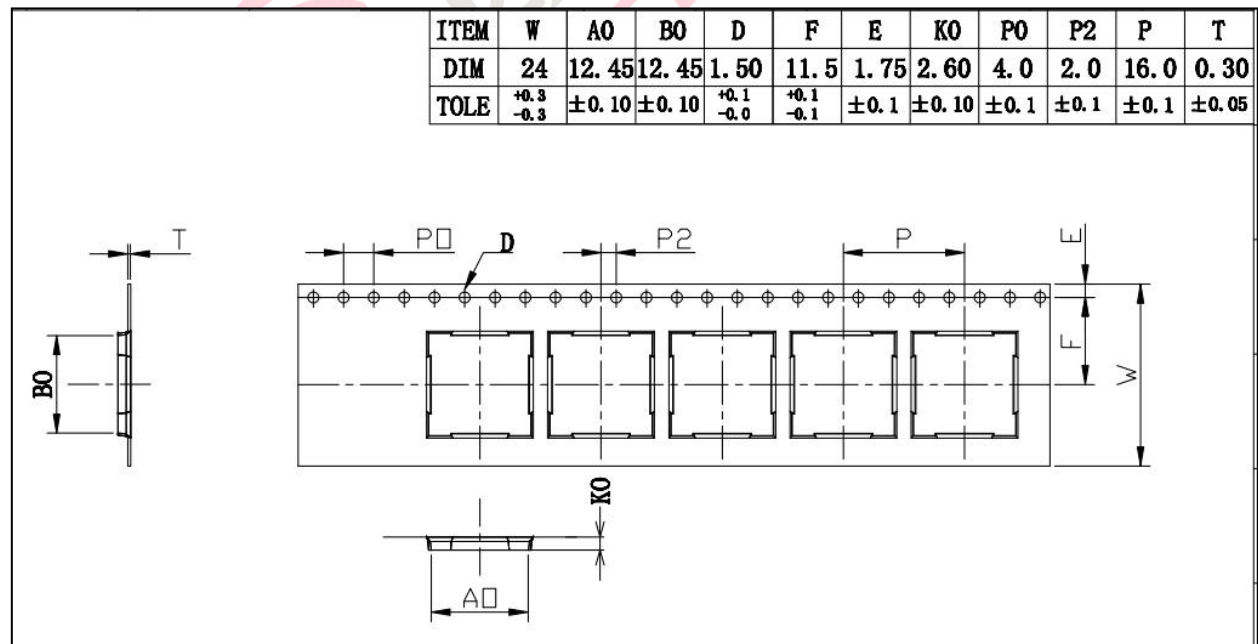
13. Package

13.1 Reel

A roll of 1500pcs



13.2 Carrier Tape Detail



13.3 Packaging Detail

the take-up package



Using self-adhesive tape

Size of black tape: 24mm*32.6m the cover tape :21.3mm*32.6m

Color of plastic disc: blue



NY bag size:460mm*385mm



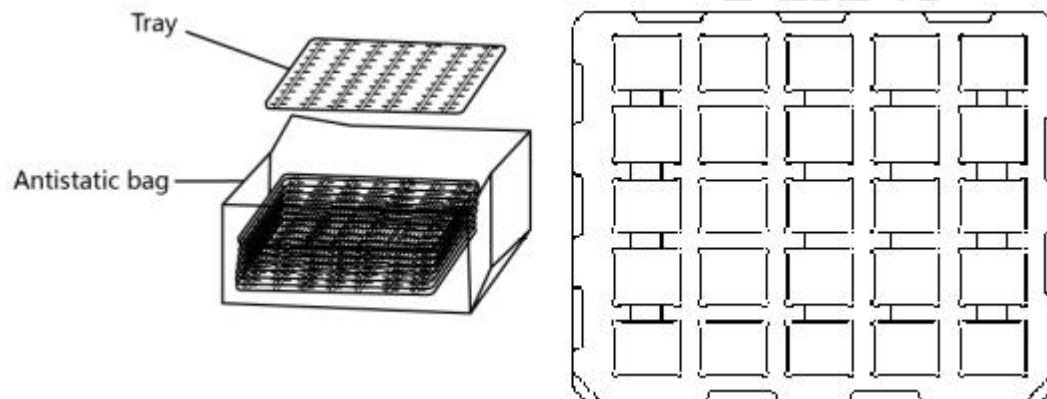
size : 350*350*35mm



The packing case size:350*210*370mm

13.4 Tray

Use pallet packaging for less than 300 pieces



14. Moisture sensitivity

The Modules is a Moisture Sensitive Device level 3, in according with standard IPC/JEDEC J-STD-020, take care

all the relatives requirements for using this kind of components.

Moreover, the customer has to take care of the following conditions:

- a) Calculated shelf life in sealed bag: 12 months at <40°C and <90% relative humidity (RH)
- b) Environmental condition during the production: 30°C / 60% RH according to IPC/JEDEC J-STD-033A paragraph 5
- c) The maximum time between the opening of the sealed bag and the reflow process must be 168 hours if condition b) “IPC/JEDEC J-STD-033A paragraph 5.2” is respected
- d) Baking is required if conditions b) or c) are not respected
- e) Baking is required if the humidity indicator inside the bag indicates 10% RH or more