

**PRODUCT SPECIFICATION**

**6233A-SRB**

**Wi-Fi Dual-band 1x1 + BT5.2**

**Combo Module**

Version:v1.2



## 6233A-SRB Module Datasheet

	Part NO.	Description
<b>Ordering Information</b>	FG6233ASRB-00	RTL8733BS,802.11b/g/n/a+BLE5.2,1T1R+BT ANT, 12*12 ,SDIO2.0/Uart,dual-ANT
	FG6233ASRB-01	RTL8733BS,802.11b/g/n/a+BLE5.2,1T1R+BT ANT, 12*12 ,SDIO2.0/Uart,single-ANT

**Customer:** \_\_\_\_\_

**Customer P/N:** \_\_\_\_\_

**Signature:** \_\_\_\_\_

**Date:** \_\_\_\_\_

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**Revision History**

Version	Date	Contents of Revision Change	Prepared	Checked	Approved
V1.0	2020/08/21	New version	LXY	LXY	Szs
V1.1	2021/11/20	Update the specification format Add BT Specification	FC	LXY	QJP
V1.2	2022/6/13	Add -01 single antenna version	FC	LXY	QJP

# 1. General Description

## 1.1 Introduction

6233A-SRB is a small size and low profile of Wi-Fi + BT Combo module with LGA module, board size is 12\*12mm. It can be easily manufactured on SMT process and highly suitable for tablet PC, mobile device and consumer products. It provides SDIO 2.0 interface for Wi-Fi to connect with host processor and high speed UART interface for BT5.2. It also has a PCM interface for audio data transmission with direct link to external audio codec via BT controller.

The Wi-Fi throughput up to 150Mbps in theory by using 802.11n technology.

## 1.2 Description

Model Name	6233A-SRB
Product Description	Support Wi-Fi/Bluetooth functionalities
Dimension	L x W x H: 12 x 12 x2.3 (typical) mm
Wi-Fi Interface	Support SDIO V1.1/2.0
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

- Operate at 2.4G&5GHz frequency bands
- IEEE standards support: IEEE 802.11a, IEEE 802.11b, IEEE 802.11g, IEEE 802.11n, IEEE 802.11d, IEEE 802.11e, IEEE 802.11h, IEEE 802.11i
- Enterprise level security which can apply WPA/WPA2/WPA3
- Wi-Fi 1T1R allow data rates supporting up to 150 Mbps PHY rates

### Host Interface

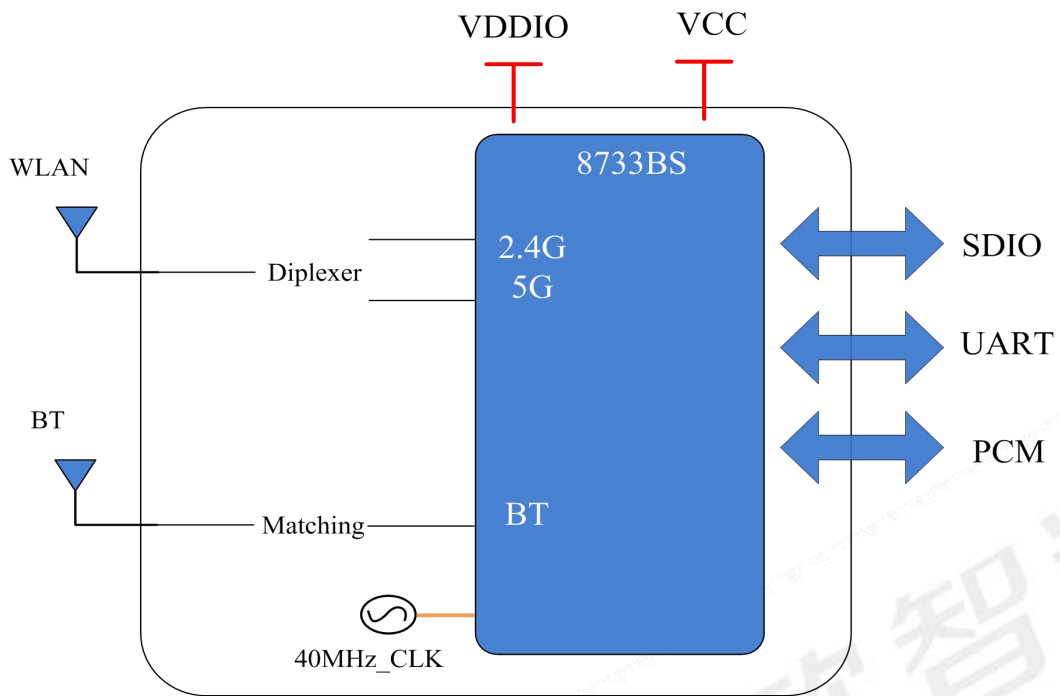
- SDIO2.0 for Wi-Fi and UART for BT5.2
- PCM interface for audio data transmission via BT controller

### Bluetooth Features

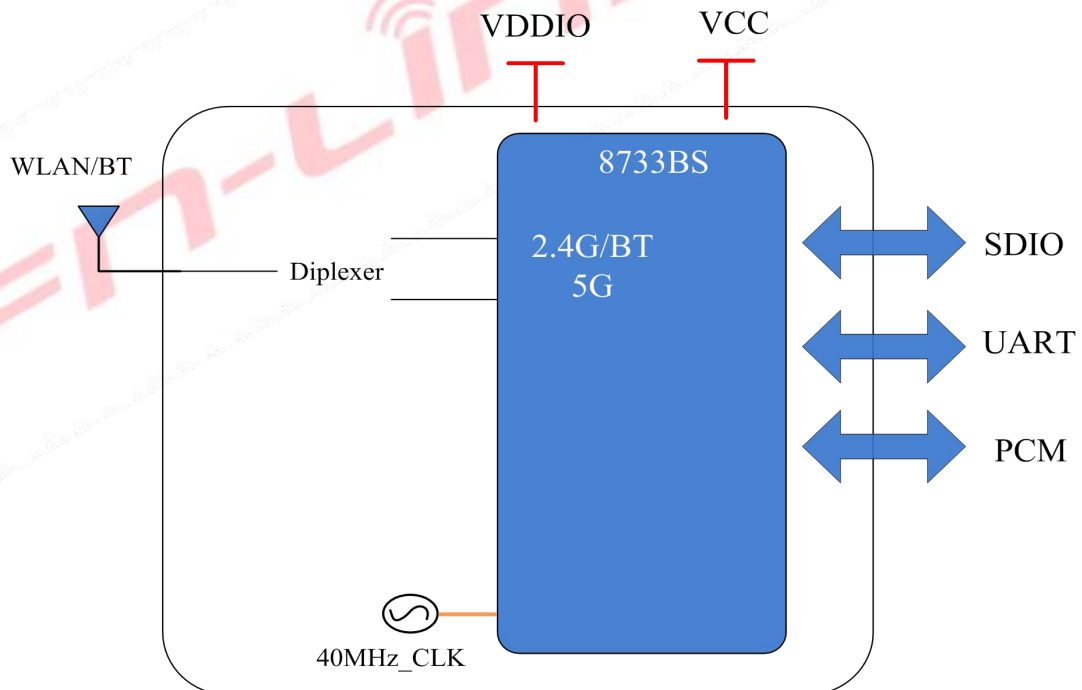
- Compatible with Bluetooth v2.1+EDR v5.2 system
- Support BLE4.0, BT5.2 dual mode

## 3. Block Diagram

---dual antenna version



---single antenna version



## 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		
Test Items	Typical Value		EVM
Output Power <sup>1</sup>	802.11b /11Mbps : 17dBm ± 2 dB		EVM ≤ -9dB
	802.11g /54Mbps : 15dBm ± 2 dB		EVM ≤ -25dB
	802.11n /MCS7 : 14dBm ± 2 dB		EVM ≤ -28dB
Spectrum Mask	Meet with IEEE standard		
Freq. Tolerance	± 20ppm		
SISO Receive Sensitivity (11b,20MHz) @8% PER	- 1Mbps	PER @ -92 dBm	≤-83
	- 2Mbps	PER @ -90 dBm	≤-80
	- 5.5Mbps	PER @ -87 dBm	≤-79
	- 11Mbps	PER @ -85 dBm	≤-76
SISO Receive Sensitivity (11g,20MHz) @10% PER	- 6Mbps	PER @ -89 dBm	≤-85
	- 9Mbps	PER @ -88 dBm	≤-84
	- 12Mbps	PER @ -87 dBm	≤-82
	- 18Mbps	PER @ -84 dBm	≤-80
	- 24Mbps	PER @ -81 dBm	≤-77
	- 36Mbps	PER @ -78 dBm	≤-73
	- 48Mbps	PER @ -73 dBm	≤-69
	- 54Mbps	PER @ -71 dBm	≤-68
SISO Receive Sensitivity (11n,20MHz) @10% PER	- MCS=0	PER @ -89 dBm	≤-85
	- MCS=1	PER @ -86 dBm	≤-82
	- MCS=2	PER @ -84 dBm	≤-80
	- MCS=3	PER @ -80 dBm	≤-77
	- MCS=4	PER @ -77 dBm	≤-73
	- MCS=5	PER @ -72 dBm	≤-69
	- MCS=6	PER @ -71 dBm	≤-68
	- MCS=7	PER @ -69 dBm	≤-67
SISO Receive Sensitivity (11n,40MHz) @10% PER	- MCS=0,	PER @ -88 dBm	≤-82
	- MCS=1,	PER @ -85 dBm	≤-79
	- MCS=2,	PER @ -83 dBm	≤-77



	- MCS=3, PER @ -79 dBm	≤-74
	- MCS=4, PER @ -76 dBm	≤-70
	- MCS=5, PER @ -71 dBm	≤-66
	- MCS=6, PER @ -70 dBm	≤-65
	- MCS=7, PER @ -68 dBm	≤-64
Maximum Input Level	802.11b : -10 dBm	
	802.11g/n : -20 dBm	
Antenna Reference	Small antennas with 0~2 dBi peak gain	

1. TX power can control by driver side to increase or decrease the output value;

#### 4.2 5GHz WI-FI Specification

Feature	Description	
WLAN Standard	IEEE 802.11a/n Wi-Fi compliant	
Frequency Range <sup>1</sup>	5.150 GHz ~ 5.850 GHz (5.0 GHz Band)	
Number of Channels	5.0GHz: Please see the table1	
Test Items	Typical Value	EVM
Output Power <sup>2</sup>	802.11a/54Mbps : 15dBm ± 2 dB	EVM ≤ -25dB
	802.11n/MCS7 : 14dBm ± 2 dB	EVM ≤ -28dB
Test Items	Test Value	Standard Value
SISO Receive Sensitivity (11a,20MHz) @10% PER	- 6Mbps PER @ -88 dBm	≤-85
	- 9Mbps PER @ -87 dBm	≤-84
	- 12Mbps PER @ -86 dBm	≤-82
	- 18Mbps PER @ -83 dBm	≤-80
	- 24Mbps PER @ -80 dBm	≤-77
	- 36Mbps PER @ -77 dBm	≤-73
	- 48Mbps PER @ -72 dBm	≤-69
	- 54Mbps PER @ -70 dBm	≤-68
SISO Receive Sensitivity (11n,20MHz) @10% PER	- MCS=0 PER @ -88 dBm	≤-85
	- MCS=1 PER @ -85 dBm	≤-82
	- MCS=2 PER @ -83 dBm	≤-80
	- MCS=3 PER @ -80 dBm	≤-77

	- MCS=4	PER @ -76 dBm	≤-73
	- MCS=5	PER @ -71 dBm	≤-69
	- MCS=6	PER @ -70 dBm	≤-68
	- MCS=7	PER @ -69 dBm	≤-67
SISO Receive Sensitivity (11n,40MHz) @10% PER	- MCS=0	PER @ -85 dBm	≤-82
	- MCS=1	PER @ -82 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 @ -68 dBm	≤-65
	- MCS=7	PER @ -67 dBm	≤-64
Maximum Input Level	802.11a/n : -30 dBm		
Antenna Reference	Small antennas with 0~2 dBi peak gain		

2. TX power can control by driver side to increase or decrease the output value;

**15GHz(20MHz) Channel table**

Band range	Operating Channel Numbers	Channel center frequencies(MHz)
5180MHz~5240MHz	36	5180
	40	5200
	44	5220
	48	5240
5260MHz~5320MHz	52	5260
	56	5280
	60	5300
	64	5320
5550MHz~5700MHz	100	5500
	104	5520
	108	5540
	112	5560
	116	5580
	120	5600
	124	5620
	128	5640
132	5660	

	136	5680
	140	5700
5745MHz~5825MHz	149	5745
	153	5765
	157	5785
	161	5805
	165	5825

### 4.3 Bluetooth Specification

Feature	Description		
<b>General Specification</b>			
Bluetooth Standard	Bluetooth V5.2/2.1		
Host Interface	UART		
Antenna Reference	Small antennas with 0~2 dBi peak gain		
Frequency Band	2402 MHz ~ 2480 MHz		
Number of Channels	79 channels		
Modulation	GFSK, $\pi/4$ -DQPSK, 8-DPSK		
<b>RF Specification</b>			
	<b>Min(dBm)</b>	<b>Typical(dBm)</b>	<b>Max(dBm)</b>
Output Power (Class 1)	2	5	8
Sensitivity @ BER=0.1% for GFSK (1Mbps)		-92	
Sensitivity @ BER=0.01% for $\pi/4$ -DQPSK (2Mbps)		-86	
Sensitivity @ BER=0.01% for 8DPSK (3Mbps)		-85	
Maximum Input Level	GFSK (1Mbps):-20dBm		
	$\pi/4$ -DQPSK (2Mbps) :-20dBm		

	8DPSK (3Mbps) :-20dBm
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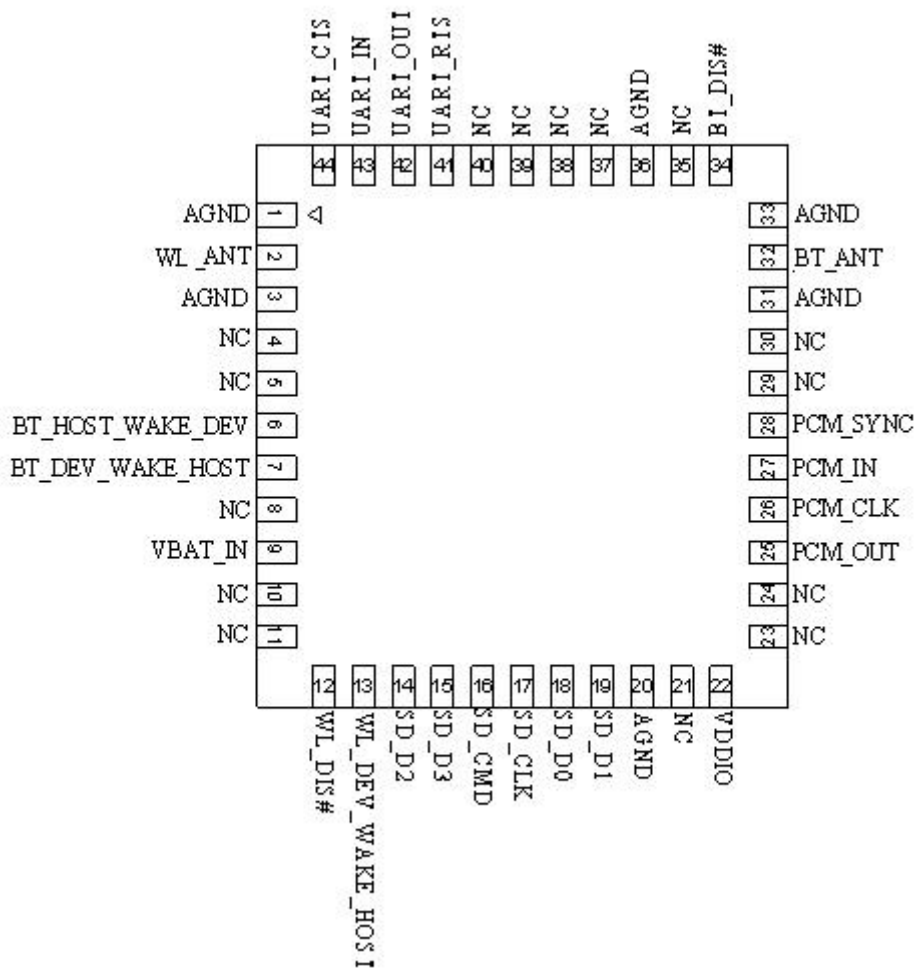
## 5. ID setting information

WI-FI

Vendor ID	024C
Product ID	B733

## 6. Pin Definition

### 6.1 Pin Outline



## 6.2 Pin Definition details

NO.	Name	Type	Description	Voltage
1	GND	—	Ground connections	
2	WL_ANT	I/O	WL port for dual antenna type WL/BT port for single antenna type	
3	GND	—	Ground connections	
4	NC		Floating (NC)	
5	NC		Floating (NC)	
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 (NC)	
9	VBAT_IN	P	3.3V±10% Main power voltage source input	3.3V
10	NC		Floating (NC)	
11	NC		Floating (NC)	
12	WL_DIS#	I	This pin pull low can externally shut down the WLAN function. (may not supported recently)	3.3V
13	WL_HOST_WAKE	O	WLAN to wake up HOST	VDDIO
14	SD_D2	I/O	SDIO data line 2	
15	SD_D3	I/O	SDIO data line 3	
16	SD_CMD	I/O	SDIO command line	
17	SD_CLK	I	SDIO clock line	
18	SD_D0	I/O	SDIO data line 0	
19	SD_D1	I/O	SDIO data line 1	
20	AGND		Ground connections	
21	NC		Floating(NC)	
22	VDDIO	P	I/O Voltage supply input	1.8/3.3V
23	NC		Floating (NC)	
24	NC	I	32.768KHz Clock Input, Can keep NC	
25	PCM_OUT	O	PCM Output This pin should not pull high during power on module.(H-LDO mode , L-SWR mode)	VDDIO
26	PCM_CLK	I/O	PCM Clock	VDDIO
27	PCM_IN	I	PCM Input This pin should not pull high during power on module.(H-test mode ,L-normal mode)	VDDIO

28	PCM_SYNC	O	PCM Sync, default low This pin should not pull high during power on moduel . (H-external EEPROM ,L-internal NV memory)	VDDIO
29	NC		Floating (NC)	
30	NC		Floating (NC)	
31	AGND		Ground connections	
32	BT_ANT	I/O	BT port 1 for dual antenna type NC if module is single antenna type	
33	AGND		Ground connections	
34	BT_DIS#	I	BT Reset IN	3.3V
35	NC		Floating (NC)	
36	AGND		Ground connections	
37	NC		Floating (NC)	
38	NC		Floating (NC)	
39	NC		Floating (NC)	
40	NC		Floating (NC)	
41	UART_RTS		UART RTS Module pin is Ground connections	
42	UART_OUT	O	UART Output	VDDIO
43	UART_IN	I	UART Input	VDDIO
44	UART_CTS	I	UART CTS	VDDIO

P:POWER I:INPUT O:OUTPUT

## 7. Electrical Specifications

### 7.1 Power Supply DC Characteristics

	Min.	Typ.	Max.	Unit
Operating Temperature	0	25	70	deg.C
VCC33	3.15	3.3	3.45	V
VDDIO	1.7	1.8 or 3.3	3.45	V

## 7.2 Power Consumption

Power Consumption	TX HT40 11n Mode	106mA
	TX HT20 11n Mode	121.2mA
	TX HT20 11g Mode	126mA
	TX HT20 11b Mode	264mA
	RX Mode	69mA

## 7.3 Interface Circuit time series

### 7.3.1 SDIO Pin Description

The module supports SDIO version 2.0 for all 1.8V / 3.3V .

#### 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

### 7.3.2 SDIO Default Mode Timing Diagram

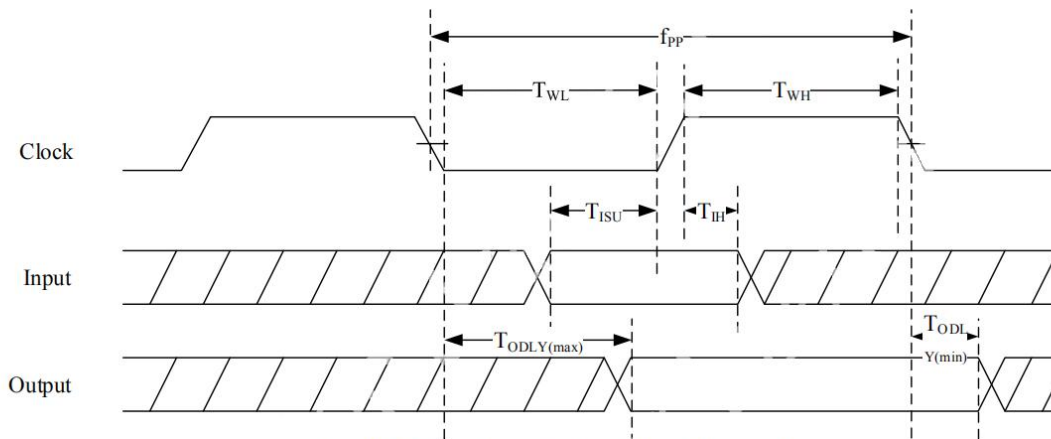


Figure 4. SDIO Interface Timing (default speed)

Table 13. SDIO Interface Timing Parameters (default speed)

NO	Parameter	MIN	MAX	Unit
$f_{PP}$	Clock Frequency	0	25	MHz
$T_{WL}$	Clock Low Time	10	-	ns
$T_{WH}$	Clock High Time	10	-	ns
$T_{ISU}$	Input Setup Time	5	-	ns
$T_{IH}$	Input Hold Time	5	-	ns
$T_{ODLY}$	Output Delay Time During Data Transfer Mode	0	14	ns
$T_{ODLY}$	Output Delay Time During Identification Mode	0	50	ns

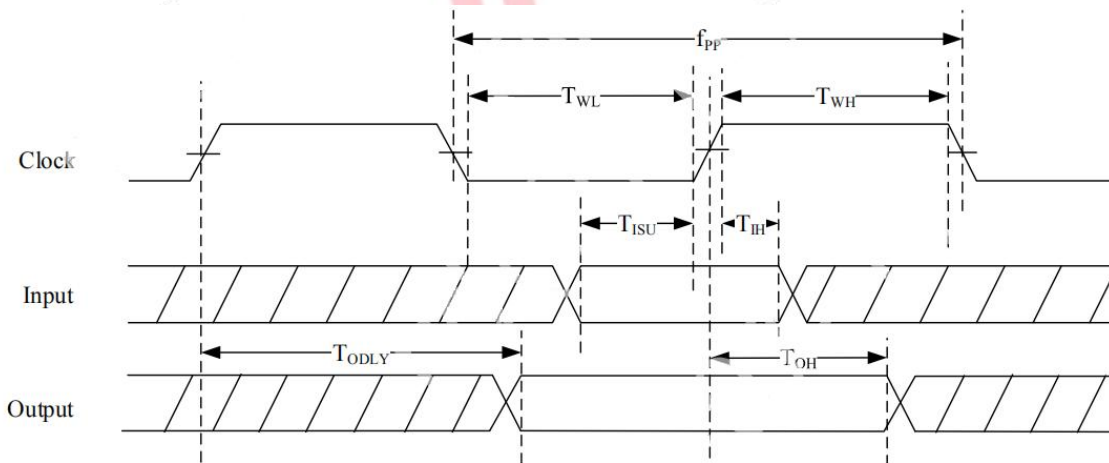


Figure 5. SDIO Interface Timing (high speed)



NO	Parameter	MIN	MAX	Unit
f <sub>PP</sub>	Clock Frequency	0	50	MHz
T <sub>WL</sub>	Clock Low Time	7	-	ns
T <sub>WH</sub>	Clock High Time	7	-	ns
T <sub>ISU</sub>	Input Setup Time	6	-	ns
T <sub>IH</sub>	Input Hold Time	2	-	ns
T <sub>ODLY</sub>	Output Delay Time During Data Transfer Mode	-	14	ns
T <sub>OH</sub>	Output Hold Time	2.5	-	ns

### 7.3.3 SDIO Power-on sequence

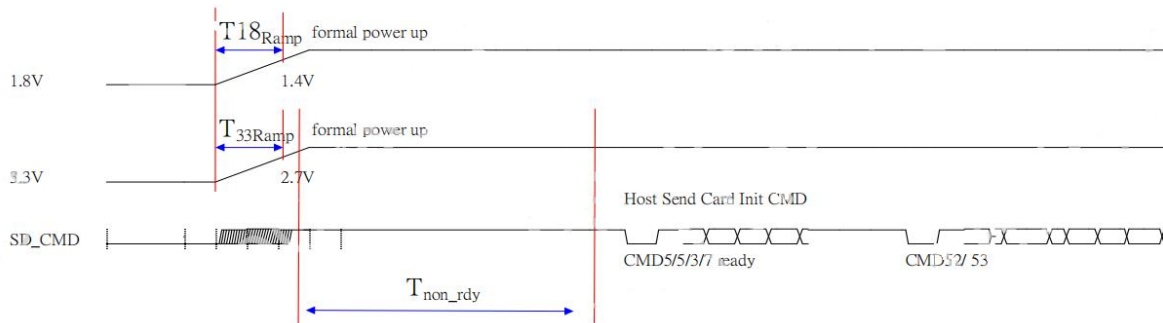


Figure 6. SDIO Interface Power-On Sequence

Table 15. SDIO Interface Power-On Sequence

Symbol	Description
T <sub>33ramp</sub>	The 3.3V main power ramp up duration.
T <sub>18ramp</sub>	The 1.8V main power ramp up duration.
T <sub>non_rdy</sub>	SDIO Not Ready Duration. In this state, the RTL8723FS may respond to commands without the ready bit being set. After the ready bit is set, the host will initiate complete card detection procedure.

We recommend that the card detection procedures are divided into two phases: A 3.3V power pre-charge phase and a formal power-up phase.


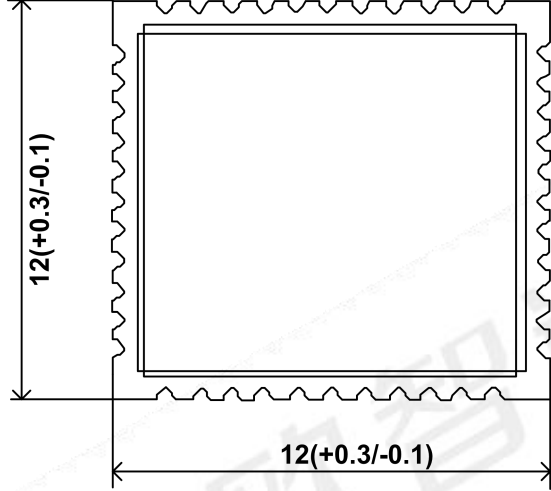
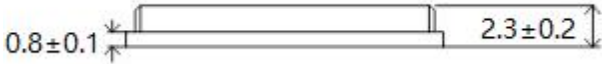
After main 3.3V ramp up and 1.8V ramp up, the power management unit is enabled by the power ready detection circuit. The power management unit enables the SDIO block. eFUSE is then autoloaded to SDIO circuits during the T<sub>non\_rdy</sub> duration. After CMD5/5/3/7 procedures, card detection is executed. When the driver has loaded, normal CMD52 and CMD53 are used.

Table 16. SDIO Interface Power-On Timing Parameters

	Min	Typical	Max	Unit
T33ramp	0.2	0.5	2.5	ms
T18ramp	0.2	0.5	2.5	ms
Tnon-rdy	1	2	10	ms

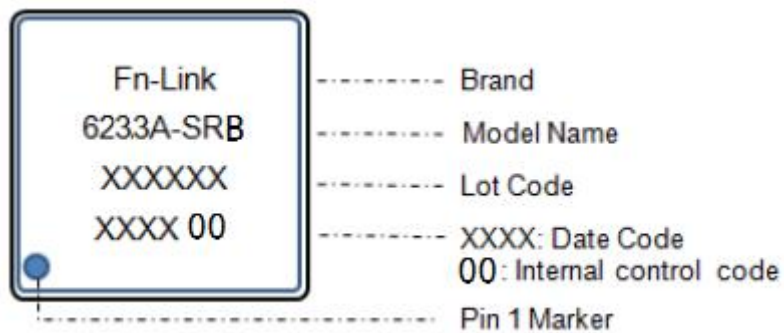
## 8. Size reference

### 8.1 Module Picture

<p>L x W : 12 x 12 (+0.3/-0.1) mm</p> 	
<p>H: 2.3 (±0.2) mm</p>	
<p><b>Weight</b></p>	<p>0.59g</p>

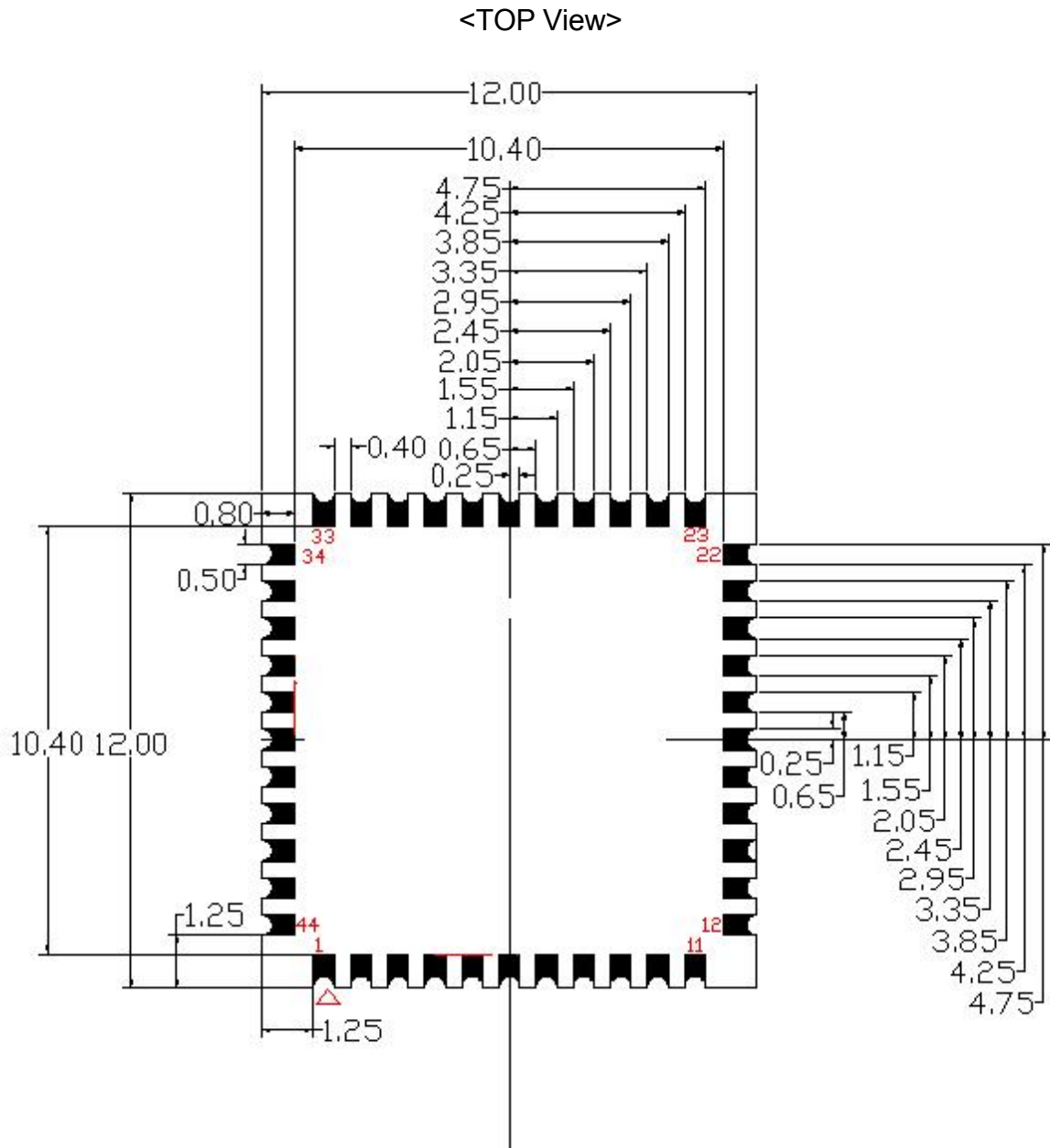
### 8.2 Marking Description

< TOP VIEW >

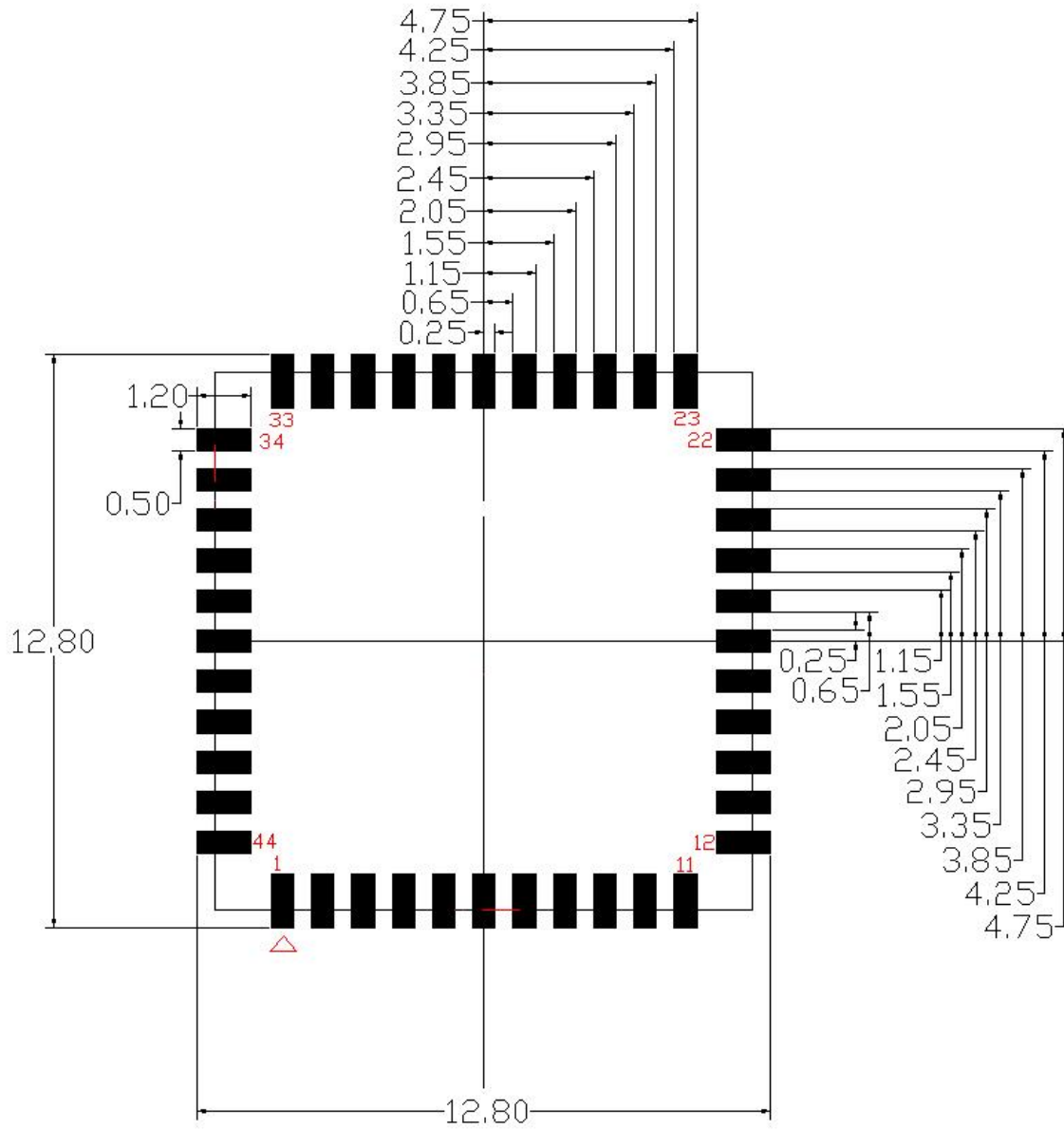


- 00: dual antenna
- 01: single antenna

### 8.3 Physical Dimensions



### 8.4 Layout Recommendation

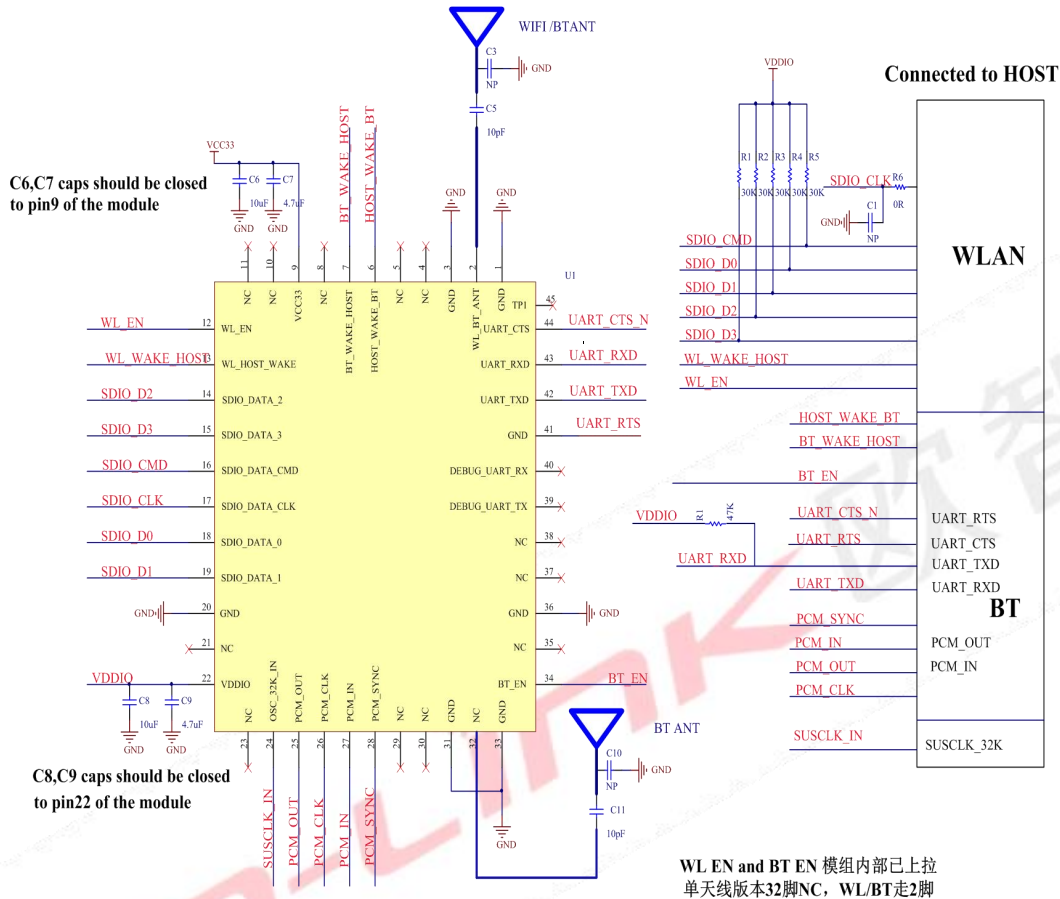


### 9. The Key Material List

Chipset	RTL8733BS_QFN48	Realtek
PCB	6233A-SRB PCB green,4layer,FR4,12X12X0.8mm	XY-PCB,KX-PCB,SL-PCB,Sunlord,SL-PCB,XL PCB

Crystal	2520 40MHz 10ppm 12PF -20-85° C	ECEC,TKD,JWT,Hosonic
TVS	0201 4V 0.05pF 15KV TVS	Murata,sunlord,way-on

### 10. Reference Design

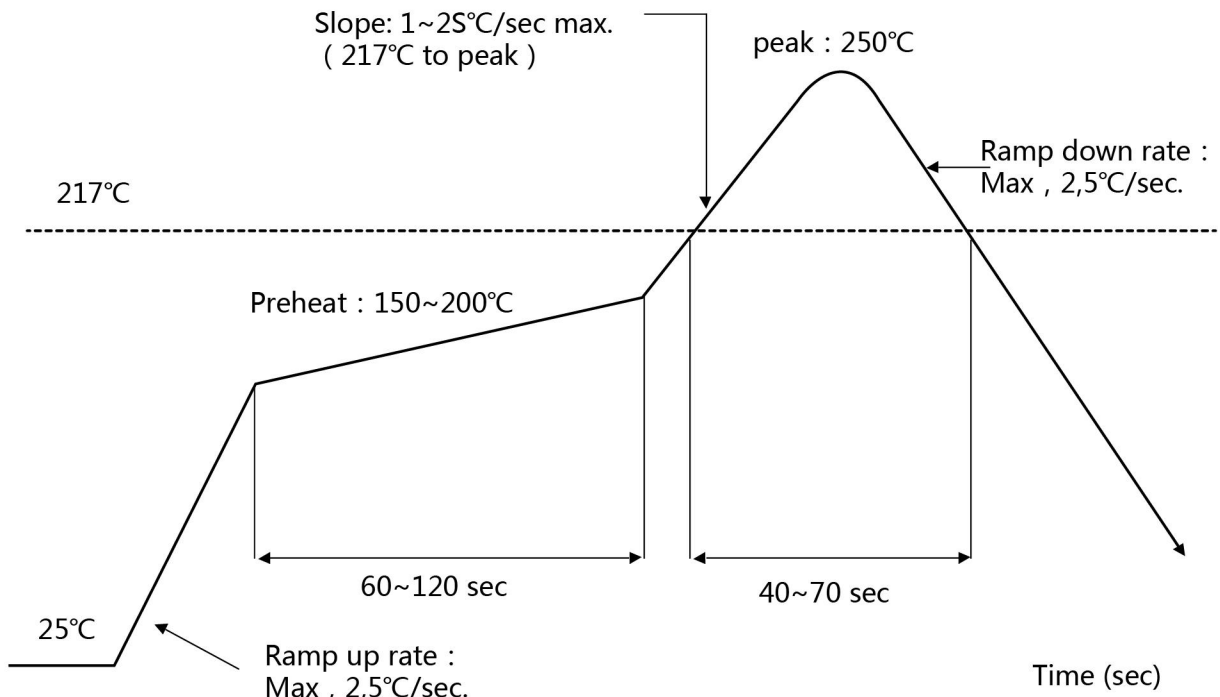


## 11. Recommended Reflow Profile

Referred to IPC/JEDEC standard.

Peak Temperature : <math><250^{\circ}\text{C}</math>

Number of Times :  $\leq 2$  times



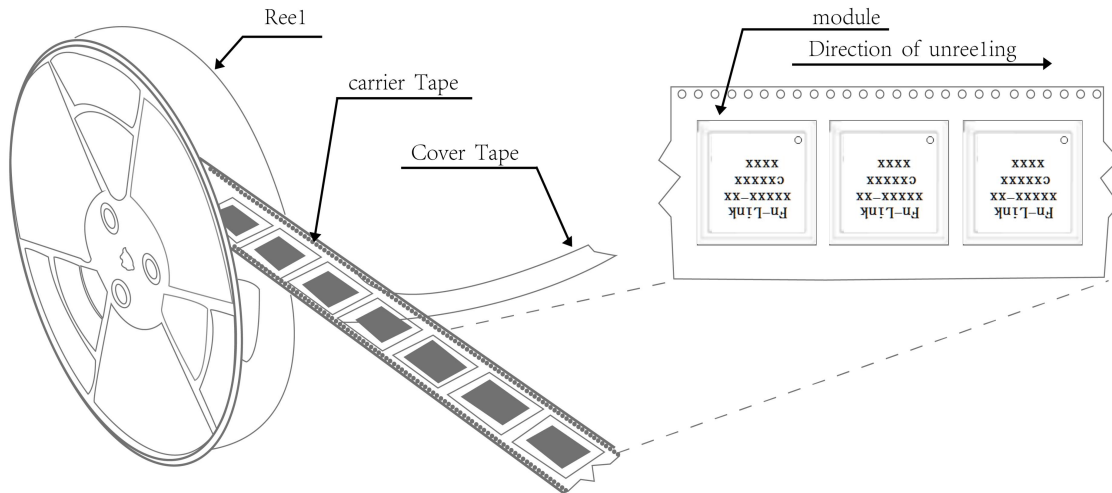
## 12. RoHS compliance

All hardware components are fully compliant with EU RoHS directive

### 13. Package

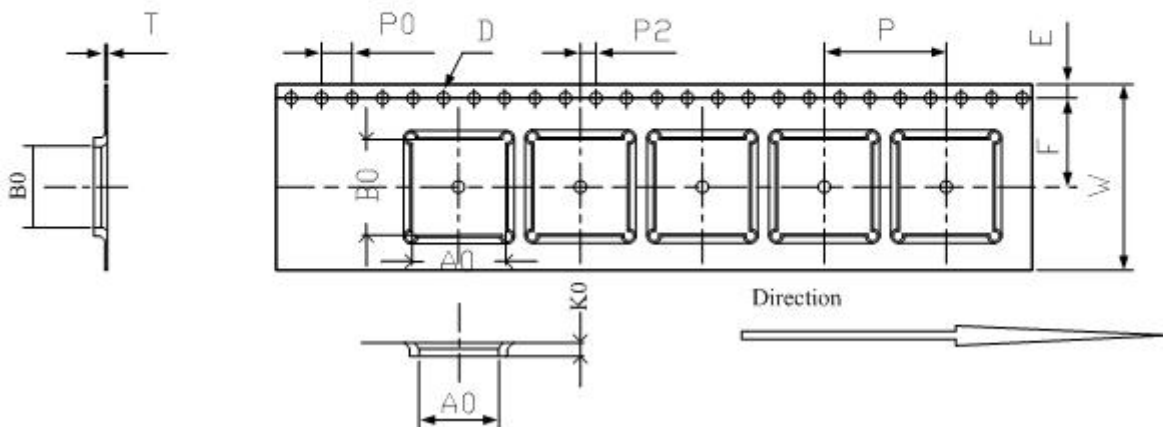
#### 13.1 Reel

A roll of 1500pcs



#### 13.2 Carrier Tape Detail

ITEM	W	A0	B0	D	F	E	K0	P0	P2	P	T
DIM	24	12.40	12.40	1.50	11.5	1.75	2.6	4.0	2.0	16.0	0.30
TOLE	+0.3 -0.3	±0.10	±0.10	-0.1 -0.0	-0.1 -0.1	+0.1	+0.10	±0.1	±0.1	±0.1	±0.05



#### 13.3 Packaging Detail

the take-up package





Using self-adhesive tape

Size of black tape: 24mm\*32.6m the cover tape :21.33mm\*32.6m

Color of plastic disc: black



NY bag size:450mm\*415mm



size : 350\*350\*35mm



The packing case size:350\*210\*370mmg



## 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 <math><40^{\circ}\text{C}</math> and <math><90\%</math> relative humidity (RH)
- b) Environmental condition during the production:  $30^{\circ}\text{C}$  / 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