

PRODUCT SPECIFICATION

K255B-SR

Wi-Fi Dual-band 1x1 11a/b/g/n/ac +Bluetooth 5.0

Combo Module

Version:v8.5

K255B-SR Module Datasheet

Ordering Information	Part NO.	Description
	FGK255BSRX-XM	W155S1, a/b/g/n/ac, Wi-Fi, BT5.0, 1T1R, SDIO+UART, 2 Antenna version, 13x15mm(XIAOMI VERSION)
	FGK255BSRX-00	W155S1, a/b/g/n/ac, Wi-Fi, BT5.0, 1T1R, SDIO+UART, 2 Antenna version, 13x15mm(GENERAL VERSION)
	FGK255BSRX-01	W155S1, a/b/g/n/ac, Wi-Fi, BT5.0, 1T1R, SDIO+UART, 2 Antenna version, 13x15mm(SKYWORTH VERSION)
	FGK255BSRX-C0	W155S1, a/b/g/n/ac, Wi-Fi, BT5.0, 1T1R, SDIO+UART, 2 Antenna version, 13x15mm(SKYWORTH VERSION)
	FGK255BSRX-C1	W155S1, a/b/g/n/ac, Wi-Fi, BT5.0, 1T1R, SDIO+UART, 2 Antenna version, 13x15mm(SKYWORTH VERSION)

Customer: _____

Customer P/N: _____

Signature: _____

Date: _____

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CONTENTS

1. General Description	5
1.1 Introduction	5
1.2 Description	5
2. Features	6
3. Block Diagram	6
4. General Specification	7
4.1 2.4GHz RF Specification	7
4.2 5GHz RF Specification	8
4.3 Bluetooth Specification	9
5. ID setting information	10
6. Pin Definition	11
6.1 Pin Outline	11
6.2 Pin Definition details	11
7. Electrical Specifications	13
7.1 Power Supply DC Characteristics	13
7.2 Interface Circuit time series	14
7.2.1 system power on sequence	14
7.2.2 SDIO Pin Description	14
7.2.3 SDIO Default Mode Timing Diagram	15
7.2.4 SDIO High Speed Mode Timing Diagram	16
7.2.5 SDIO Bus Timing Specifications in SDR Modes	17
7.2.6 SDIO Bus Timing Specifications in DDR50 Mode	19
8. Size reference	20
8.1 Module Picture	20
8.2 Marking Description	21
8.3 List of certified information	23
8.4 Physical Dimensions	24
8.4 Layout Recommendation	25
9. The Key Material List	25
10. Reference Design	26
11. Recommended Reflow Profile	27
12. Package	28
12.1 Reel	28
12.2 Carrier Tape Detail	28
12.3 Packaging Detail	29
12.4 Tray	30
13. Moisture sensitivity	30

Revision History

[illegible]

1. General Description

1.1 Introduction

K255B-SR support 1-stream 802.11a/b/g/n/ac solution with MU-MIMO STA mode with Bluetooth smart ready controller, SDIO 3.0 interface, HS-UART mixed interface. It combines WLAN MAC, a 1T1R WLAN baseband, RF in a single chip.

Module complies with IEEE 802.11 a/b/g/n/ac standard and the speed can achieve up to 80MHz bandwidth and PHY data rate of 433Mbps.

Module complies with Bluetooth core specification V5.0, support both classic BDR/EDR and BLE mode.

1.2 Description

Model Name	K255B-SR
Product Description	Support Wi-Fi/Bluetooth functionalities
Dimension	L x W x H: 15 x 13 x 2.15 mm (typical)
Wi-Fi Interface	Support SDIO 3.0
BT Interface	UART / PCM
Operating temperature	0°C to 70°C
Storage temperature	-40°C to 85°C

2. Features

General Features

- CMOS MAC, Baseband PHY and RF in a single chip for IEEE 802.11 a/b/g/n/ac
- Support 802.11ac 1x1, compliant with MU-MIMO STA mode
- 802.11ac support maximum rate up to 433Mbps in 80MHz bandwidth

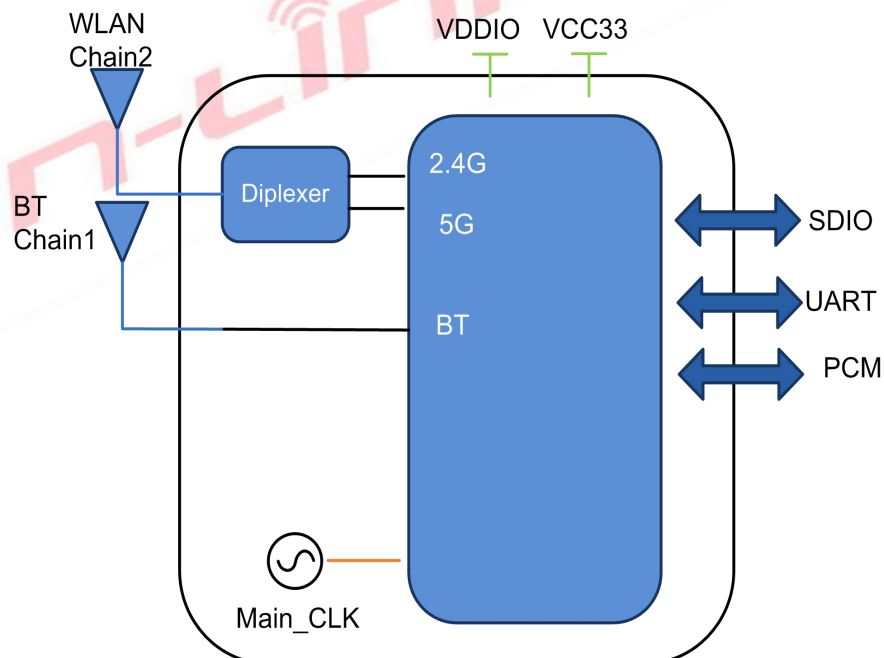
WLAN Interface

- SDIO 3.0 interface for WLAN, with rate up to 208MHz

Bluetooth Features

- Support HS-UART and PCM host interface for BT
- Supports Bluetooth V5.0 features
- Dual mode BT 5.0 supporting BDR, EDR, LE1M, LE2M and LE8S rates

3. Block Diagram



4. General Specification

4.1 2.4GHz RF 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	802.11b /11Mbps: 15dBm $\pm$ 2.0 dB	EVM $\leq$ -9dB
	802.11g /54Mbps: 16dBm $\pm$ 2.0 dB	EVM $\leq$ -25dB
	802.11n /MCS7(HT20): 15dBm $\pm$ 2.0 dB	EVM $\leq$ -28dB
	802.11n /MCS7(HT40): 14dBm $\pm$ 2.0 dB	EVM $\leq$ -28dB
Spectrum Mask	Meet with IEEE standard	
Freq. Tolerance	$\pm$ 20ppm	
Test Items	TYP Test Value	Standard Value
SISO Receive Sensitivity (11b,20MHz) @8% PER	- 1Mbps $\leq$ -92 dBm	$\leq$ -85 dBm
	- 11Mbps $\leq$ -82 dBm	$\leq$ -76 dBm
SISO Receive Sensitivity (11g,20MHz) @10% PER	- 6Mbps $\leq$ -88 dBm	$\leq$ -82 dBm
	- 54Mbps $\leq$ -71 dBm	$\leq$ -65 dBm
SISO Receive Sensitivity (11n,20MHz) @10% PER	- MCS=0 $\leq$ -87 dBm	$\leq$ -82 dBm
	- MCS=7 $\leq$ -69 dBm	$\leq$ -64 dBm
SISO Receive Sensitivity (11n,40MHz) @10% PER	- MCS=0 $\leq$ -84 dBm	$\leq$ -79 dBm
	- MCS=7 $\leq$ -66 dBm	$\leq$ -61 dBm
Maximum Input Level	802.11b : -10 dBm	
	802.11g/n : -20 dBm	
Antenna Reference	Small antennas with 0~2 dBi peak gain	

4.2 5GHz RF Specification

Feature	Description	
WLAN Standard	IEEE 802.11a/n/ac 1x1, Wi-Fi compliant	
Frequency Range	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	802.11a /54Mbps: 14 dBm $\pm$ 2.0 dB	EVM $\leq$ -25dB
	802.11n /MCS7(HT20): 14dBm $\pm$ 2.0 dB	EVM $\leq$ -28dB
	802.11n /MCS7(HT40): 13dBm $\pm$ 2.0 dB	EVM $\leq$ -28dB
	802.11ac /MCS8(vHT20): 13 dBm $\pm$ 2.0 dB	EVM $\leq$ -30dB
	802.11ac /MCS9(vHT40): 12dBm $\pm$ 2.0 dB	EVM $\leq$ -32dB
	802.11ac /MCS9(vHT80): 11 dBm $\pm$ 2.0 dB	EVM $\leq$ -32dB
Test Items	Test Value	Standard Value
Receive Sensitivity (11a, 20MHz) @10% PER	- 6Mbps $\leq$ -88 dBm	$\leq$ -82 dBm
	- 54Mbps $\leq$ -70 dBm	$\leq$ -65 dBm
Receive Sensitivity (11n, 20MHz) @10% PER	- MCS=0 $\leq$ -87 dBm	$\leq$ -82 dBm
	- MCS=7 $\leq$ -69 dBm	$\leq$ -64 dBm
Receive Sensitivity (11n, 40MHz) @10% PER	- MCS=0 $\leq$ -84 dBm	$\leq$ -79 dBm
	- MCS=7 $\leq$ -66 dBm	$\leq$ -61 dBm
Receive Sensitivity (11ac, 20MHz) @10% PER	- MCS=0 $\leq$ -86 dBm	$\leq$ -82 dBm
	- MCS=8 $\leq$ -65 dBm	$\leq$ -59 dBm
Receive Sensitivity (11ac, 40MHz) @10% PER	- MCS=0 $\leq$ -83 dBm	$\leq$ -79 dBm
	- MCS=9 $\leq$ -58 dBm	$\leq$ -54 dBm
Receive Sensitivity (11ac, 80MHz) @10% PER	- MCS=0 $\leq$ -81 dBm	$\leq$ -76 dBm
	- MCS=9 $\leq$ -55 dBm	$\leq$ -51 dBm
Maximum Input Level	802.11a/n: -30 dBm	
Antenna Reference	Small antennas with 0~2 dBi peak gain	

Conditions : VBAT=3.3V ; VDDIO=1.8V ; Temp:25°C

Note: The RF specification will be updated in future version.

¹5GHz(20MHz) Channel table

Band range	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	Bluetooth V5.0
Host Interface	UART
Antenna Reference	Small antennas with 0~2 dBi peak gain
Frequency Band	2400 MHz ~ 2483.5 MHz
Number of Channels	79 channels
Modulation	GFSK, $\pi/4$ -DQPSK, 8-DPSK

RF Specification			
	Min(dBm)	Typical(dBm)	Max(dBm)
Output Power	1	3	5
Sensitivity @ BER=0.1% for GFSK (1Mbps)			-70
Sensitivity @ BER=0.01% for $\pi/4$ -DQPSK (2Mbps)			-70
Sensitivity @ BER=0.01% for 8DPSK (3Mbps)			-70
Maximum Input Level	GFSK (1Mbps):-20dBm		
	$\pi/4$ -DQPSK (2Mbps) :-20dBm		
	8DPSK (3Mbps) :-20dBm		

Note: The RF specification will be updated in future version.

5. ID setting information

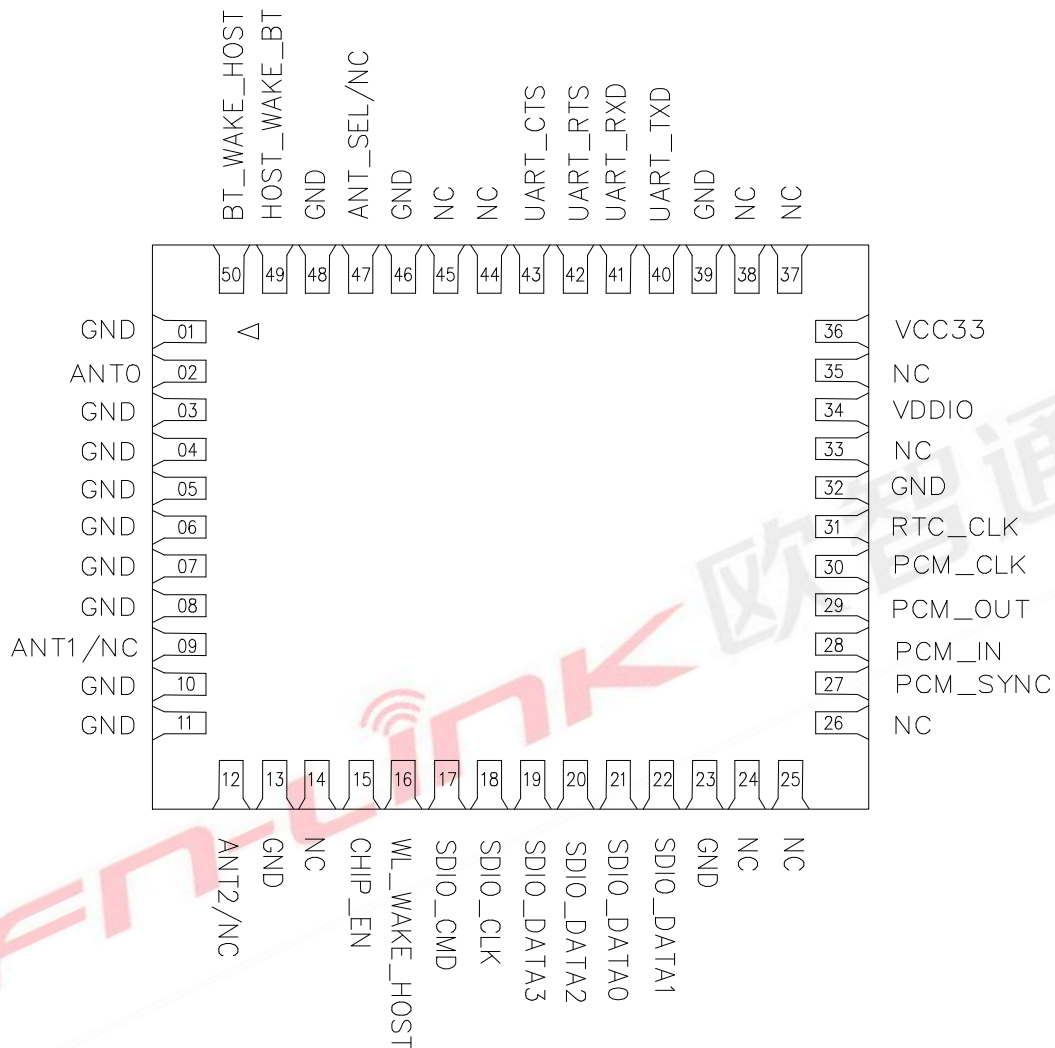
WI-FI

Vendor ID	TBD
Product ID	TBD

6. Pin Definition

6.1 Pin Outline

< TOP VIEW >



6.2 Pin Definition details

NO.	Name	Type	Description	Voltage
1	GND	—	Ground connections	
2	ANT0	I/O	RF I/O port for BT	
3	GND	—	Ground connections	
4	GND	—	Ground connections	
5	GND	—	Ground connections	

6	GND	—	Ground connections	
7	GND	—	Ground connections	
8	GND	—	Ground connections	
9	ANT1/NC	—	Dual band Wi-Fi RF I/O	
10	GND	—	Ground connections	
11	GND	—	Ground connections	
12	ANT2/NC	I/O	No connect	
13	GND	—	Ground connections	
14	NC	—	No connect	
15	CHIP_EN	I	CHIP_EN This pin can externally shut down WLAN function when pulled low, default high	1.8V
16	WL_WAKE_HOST	O	WLAN wake-up HOST	1.8V
17	SDIO_CMD	I/O	SDIO command line	1.8V
18	SDIO_CLK	I/O	SDIO clock line	1.8V
19	SDIO_DATA_3	I/O	SDIO data line 3	1.8V
20	SDIO_DATA_2	I/O	SDIO data line 2	1.8V
21	SDIO_DATA_0	I/O	SDIO data line 0	1.8V
22	SDIO_DATA_1	I/O	SDIO data line 1	1.8V
23	GND	—	Ground connections	
24	NC	—	No connect	
25	NC	—	No connect	
26	NC	—	No connect	
27	PCM_SYNC	I/O	PCM sync signal	1.8V
28	PCM_IN	I	PCM data input	1.8V
29	PCM_OUT	O	PCM Data output	1.8V
30	PCM_CLK	I/O	PCM clock	1.8V
31	RTC_CLK	I	External Low Power Clock input (32.768KHz)	
32	GND	—	Ground connections	
33	NC	—	No connect	
34	VDDIO	P	I/O Voltage supply input	1.8V
35	NC	—	No connect	
36	VCC33	P	Main power voltage source input	3.3V
37	NC	—	No connect	
38	NC	—	No connect	
39	GND	—	Ground connections	
40	UART_TXD	O	Bluetooth UART interface	1.8V

41	UART_RXD	I	Bluetooth UART interface	1.8V
42	UART_RTS_N	O	Bluetooth UART interface	1.8V
43	UART_CTS_N	I	Bluetooth UART interface	1.8V
44	NC	—	No connect	
45	NC	—	No connect	
46	GND	—	Ground connections	
47	ANT_SEL/NC	O	MUX Uart BT Print Out If not used keep NC	
48	GND	—	Ground connections	
49	HOST_WAKE_BT	I	HOST wake-up Bluetooth device The function of this PIN will be updated in future version	1.8V
50	BT_WAKE_HOST	O	Bluetooth device to wake-up HOST The function of this PIN will be updated in future version	1.8V

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

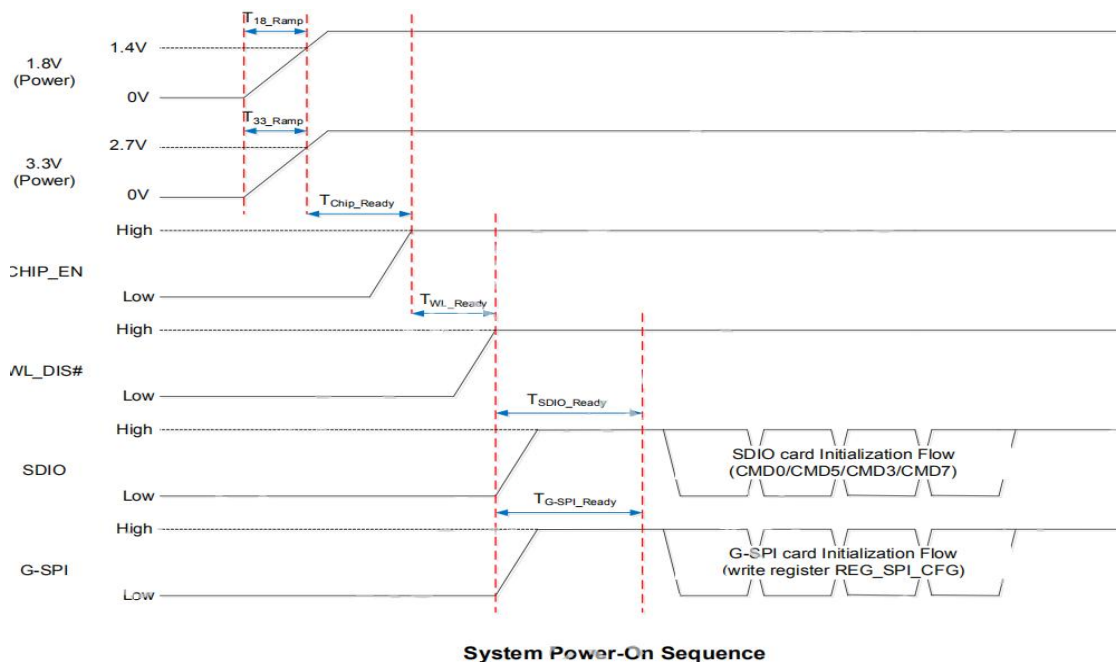
7. Electrical Specifications

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	1.62	1.8	1.98	V

7.2 Interface Circuit time series

7.2.1 system power on sequence



	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_{WL_Ready}				ms	WL_DIS# pull high timing
T_{SDIO_Ready}	1	2	10	ms	SDIO Not Ready Duration. In this state, the RTL8821CS 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

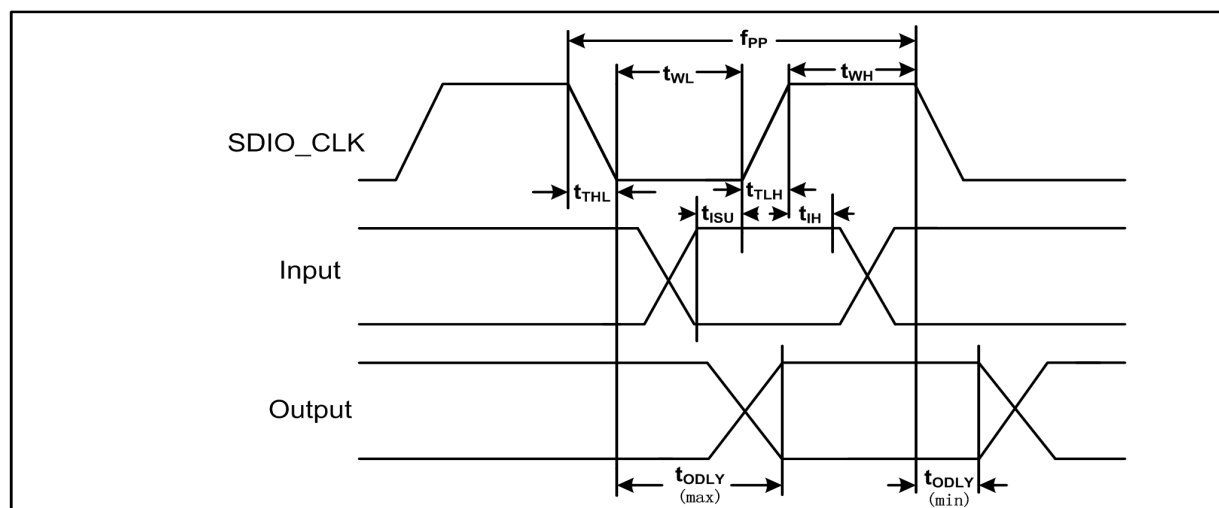
7.2.2 SDIO Pin Description

The module supports SDIO version 3.0 for all 1.8V to 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

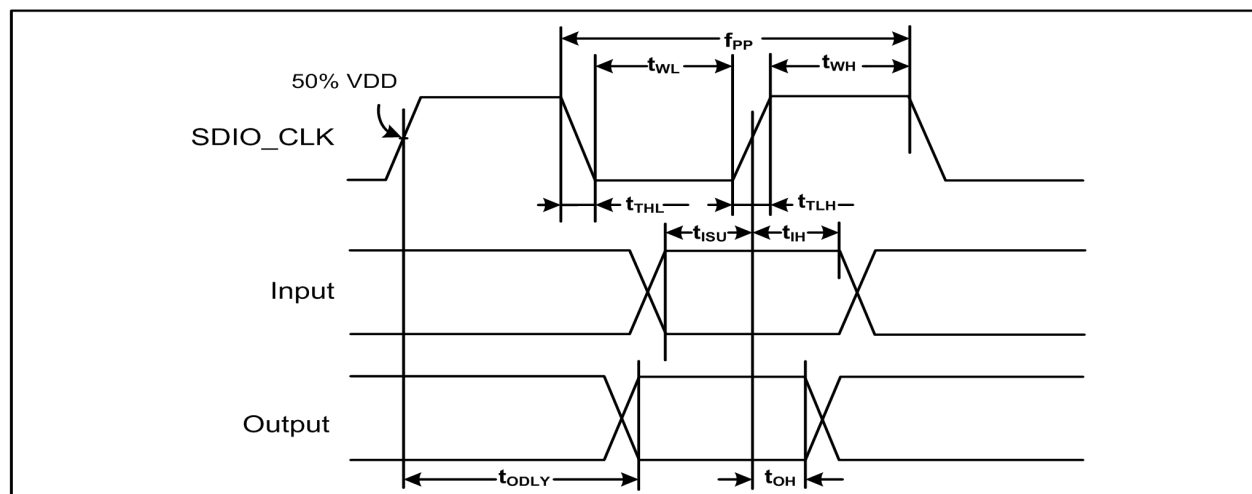
7.2.3 SDIO Default Mode Timing Diagram



Parameter	Symbol	Minimum	Typical	Maximum	Unit
SDIO CLK(All values are referred to minimum VIH and maximum VIL^b)					
Frequency - Data Transfer mode	fPP	0	-	25	MHz
Frequency - Identification mode	fOD	0	-	400	kHz
Clock low time	tWL	10	-	-	ns
Clock high time	tWH	10	-	-	ns
Clock rise time	tTLH	-	-	10	ns
Clock low time	tTHL	-	-	10	ns
Inputs:CMD, DAT(referenced to CLK)					
Input setup time	tISU	5	-	-	ns
Input hold time	tIH	5	-	-	ns
Outputs:CMD, DAT(referenced to CLK)					
Output delay time - Data Transfer mode	tODLY	0	-	14	ns
Output delay time - Identification mode	tODLY	0	-	50	ns

- a. Timing is based on $CL \leq 40$ pF load on CMD and Data.
- b. $\text{Min}(V_{ih}) = 0.7 \times V_{DDIO}$ and $\text{max}(V_{il}) = 0.2 \times V_{DDIO}$.

7.2.4 SDIO High Speed Mode Timing Diagram



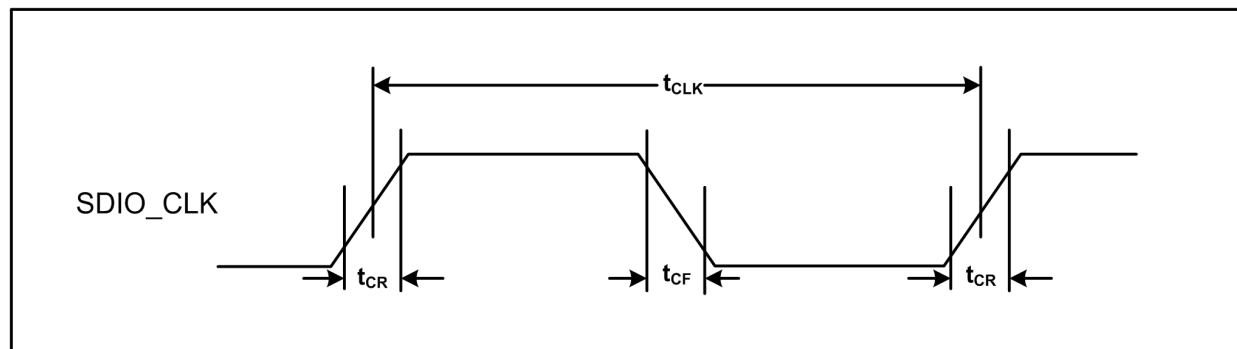
Parameter	Symbol	Minimum	Typical	Maximum	Unit
SDIO CLK(all values are referred to minimum V_{IH} and maximum V_{IL}^b)					
Frequency - Data Transfer mode	f_{PP}	0	-	50	MHz
Frequency - Identification mode	f_{OD}	0	-	400	kHz
Clock low time	t_{WL}	7	-	-	ns
Clock high time	t_{WH}	7	-	-	ns
Clock rise time	t_{TLH}	-	-	3	ns
Clock low time	t_{THL}	-	-	3	ns
Inputs:CMD, DAT(referenced to CLK)					
Input setup time	t_{ISU}	6	-	-	ns
Input hold time	t_{IH}	2	-	-	ns
Outputs:CMD, DAT(referenced to CLK)					
Output delay time - Data Transfer mode	t_{ODLY}	-	-	14	ns
Output delay time - Identification mode	t_{ODLY}	2.5	-	-	ns
Total system capacitance(each line)	CL	-	-	40	pF

a. Timing is based on $CL \leq 40$ pF load on CMD and Data.

b. $\text{Min}(V_{ih}) = 0.7 \times V_{DDIO}$ and $\text{max}(V_{il}) = 0.2 \times V_{DDIO}$.

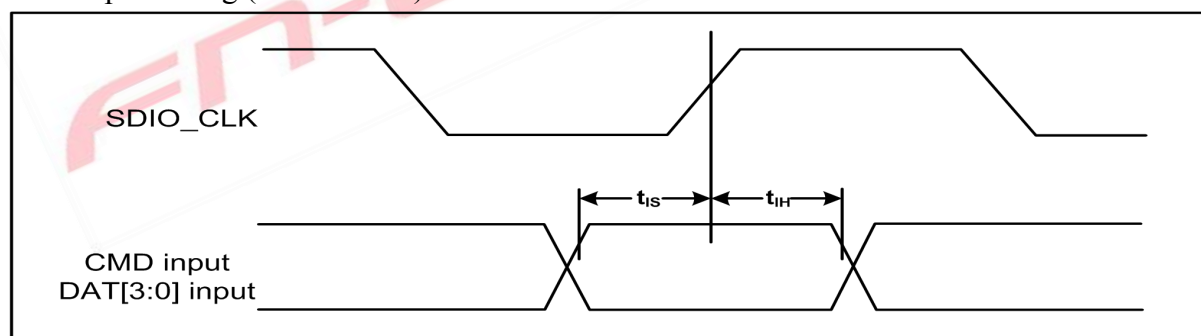
7.2.5 SDIO Bus Timing Specifications in SDR Modes

Clock timing(SDR Modes)



Parameter	Symbol	Minimum	Maximum	Unit	Comments
-	t_{CLK}	40	-	ns	SDR12 mode
-		20	-	ns	SDR25 mode
-		10	-	ns	SDR50 mode
-		4.8	-	ns	SDR104 mode
-	t_{CR}, t_{CF}	-	$0.2 \times t_{CLK}$	ns	$t_{CR}, t_{CF} < 2.00$ ns (max)@100 MHz, $C_{CARD} = 10$ pF $t_{CR}, t_{CF} < 0.96$ ns (max)@208 MHz, $C_{CARD} = 10$ pF
Clock duty	-	30	70	%	-

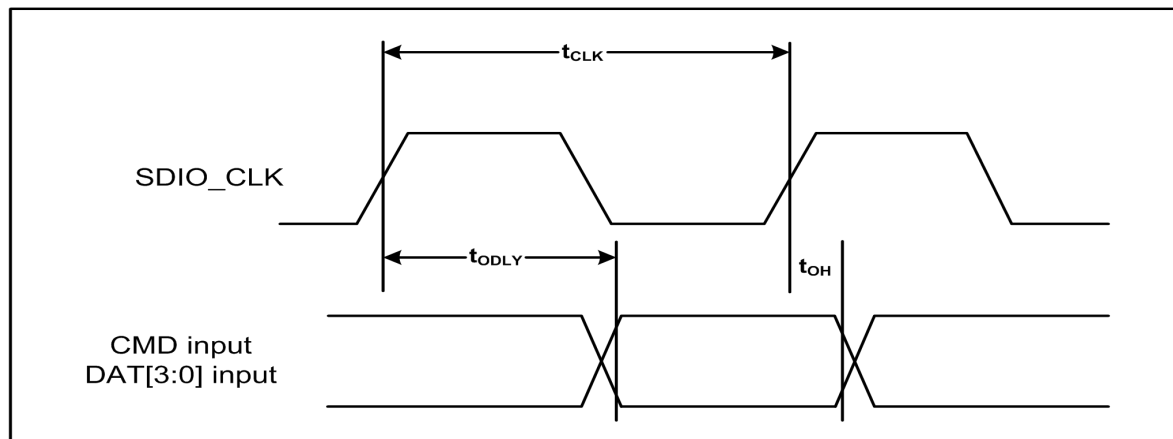
Card Input timing (SDR Modes)



Symbol	Minimum	Maximum	Unit	Comments
SDR104 Mode				
t_{IS}	1.70 ^a	-	ns	$C_{CARD} = 10$ pF, VCT = 0.975V
t_{IH}	0.80	-	ns	$C_{CARD} = 5$ pF, VCT = 0.975V
SDR50 Mode				
t_{IS}	3.00	-	ns	$C_{CARD} = 10$ pF, VCT = 0.975V
t_{IH}	0.80	-	ns	$C_{CARD} = 5$ pF, VCT = 0.975V

a. SDIO 3.0 specification value is 1.40 ns.

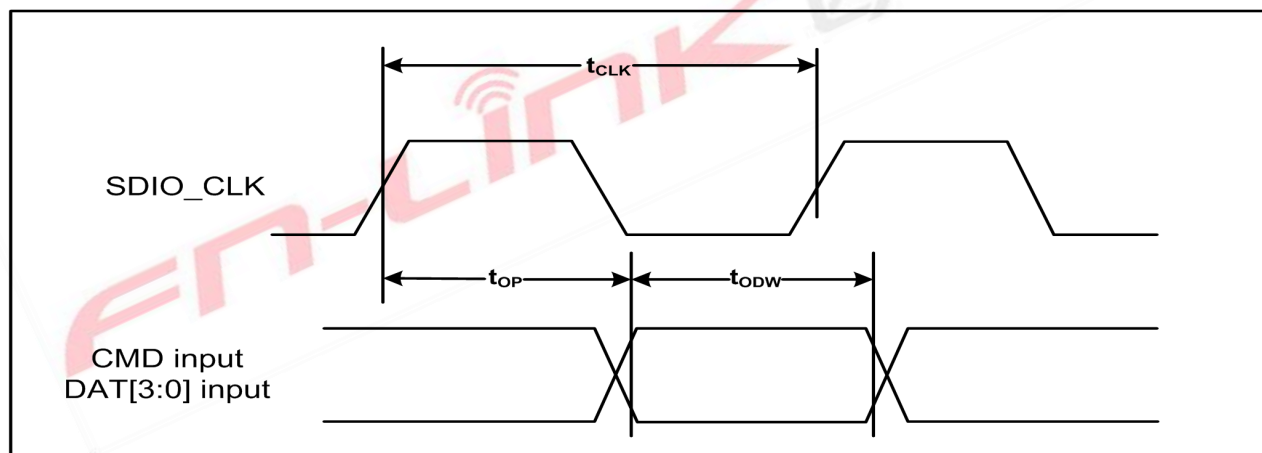
Card output timing (SDR Modes up to 100MHz)



Symbol	Minimum	Maximum	Unit	Comments
t_{ODLY}	-	7.85 ^a	ns	$t_{CLK} \geq 10$ ns $C_L = 30$ pF using driver type B for SDR50
t_{ODLY}	-	14.0	ns	$t_{CLK} \geq 20$ ns $C_L = 40$ pF using for SDR12, SDR25
t_{OH}	1.5	-	ns	Hold time at the $t_{ODLY}(\min)$ $C_L = 15$ pF

a. SDIO 3.0 specification value is 7.5 ns.

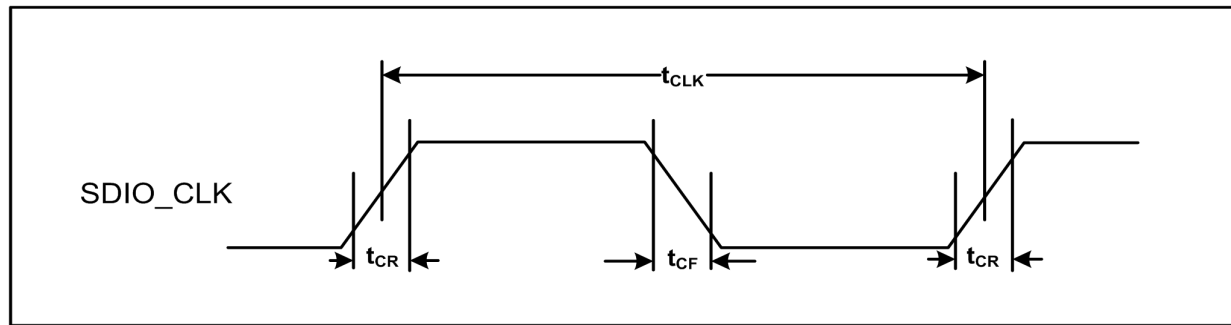
Card output timing (SDR Modes 100MHz to 208MHz)



Symbol	Minimum	Maximum	Unit	Comments
t_{OP}	0	2	UI	Card output phase
Δt_{OP}	-350	+1550	ps	Delay variation due to temp change after tuning
t_{ODW}	0.6	-	UI	$t_{ODW} = 2.88$ ns @ 208 MHz

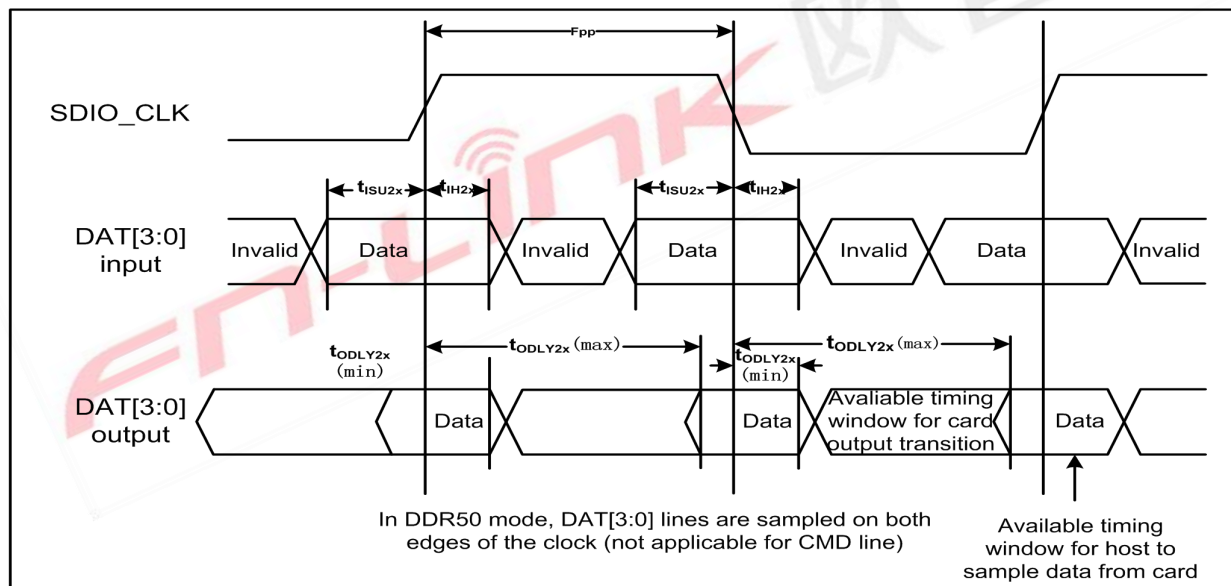
- $\Delta t_{OP} = +1550$ ps for junction temperature of $\Delta t_{OP} = 90$ degrees during operation
- $\Delta t_{OP} = -350$ ps for junction temperature of $\Delta t_{OP} = -20$ degrees during operation
- $\Delta t_{OP} = +2600$ ps for junction temperature of $\Delta t_{OP} = -20$ to $+125$ degrees during operation

7.2.6 SDIO Bus Timing Specifications in DDR50 Mode



parameter	Symbol	Minimum	Maximum	Unit	Comments
-	t_{CLK}	20	-	ns	DDR50 mode
-	t_{CR}, t_C	-	$0.2 \times t_{CLK}$	ns	$t_{CR}, t_{CF} < 4.00$ ns (max)@50 MHz, $C_{CARD} = 10$ pF
Clock duty	-	45	55	%	-

Data Timing



parameter	Symbol	Minimum	Maximum	Unit	Comments
Input CMD					
Input setup time	t_{ISU}	6	-	ns	$C_{CARD} < 10$ pF (1 Card)
Input hold time	t_{IH}	0.8	-	ns	$C_{CARD} < 10$ pF (1 Card)
Output CMD					
Output delay time	t_{ODLY}	-	13.7	ns	$C_{CARD} < 30$ pF (1 Card)
Output hold time	t_{OH}	1.5	-	ns	$C_{CARD} < 15$ pF (1 Card)
Input DAT					

Input setup time	t_{ISU2x}	3	-	ns	$C_{CARD} < 10 \text{ pF}$ (1 Card)
Input hold time	t_{IH2x}	0.8	-	ns	$C_{CARD} < 10 \text{ pF}$ (1 Card)
Output CMD					
Output delay time	t_{ODLY2x}	-	7.85 ^a	ns	$C_{CARD} < 25 \text{ pF}$ (1 Card)
Output hold time	t_{ODLY2x}	1.5	-	ns	$C_{CARD} < 15 \text{ pF}$ (1 Card)

a. SDIO 3.0 specification value is 7.0 ns

8. Size reference

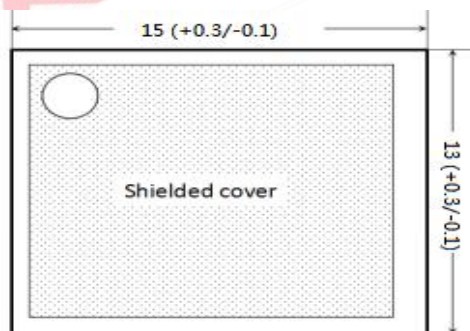
8.1 Module Picture

L x W : 15 x 13 (+0.3/-0.1) mm

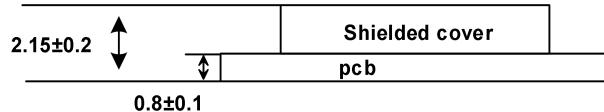
FGK255BSRX-XM:



FGK255BSRX-00:



H: 2.15 (±0.2) mm

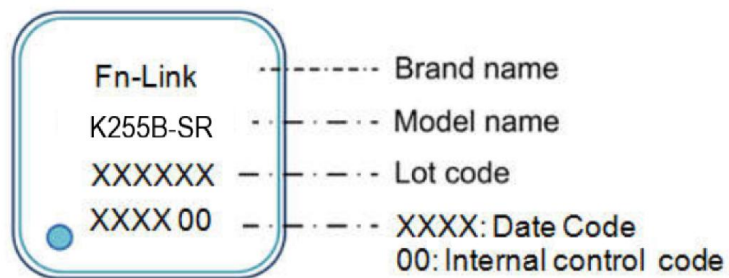
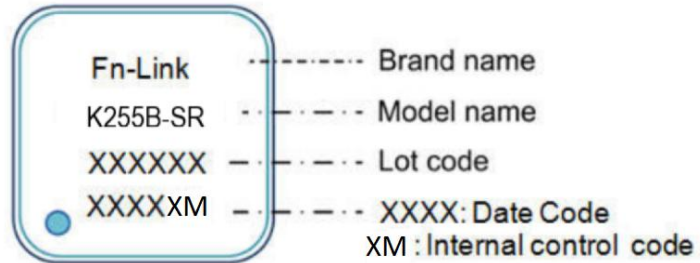


Weight

0.81 (±0.1) g

8.2 Marking Description

< TOP VIEW >



- 00, GENERAL VERSION;
- KM, XIAOMI VERSION;
- C0, SKYWORTH VERSION;
- C1, SKYWORTH VERSION;



备注:

二维码内容: 112233445566;FGK255BSRX-01

1. Fn-Link 商标 logo
2. 机型: K255B-SR
3. 二维码: “wifi mac 地址;成品料号”

例如: 112233445566;FGK255BSRX-01 (MAC 地址以实际为准)

----BT MAC 在 WIFI MAC 基础上+1 (WIFI 地址需跳 1, 不能与 BT 地址重复), 二维码中不显示此内容。



备注:

二维码内容: 112233445566;FGK255BSRX-K1

1. Fn-Link 商标 logo
2. 机型: K255B-SR
3. 二维码: “wifi mac 地址;成品料号”

例如: 112233445566;FGK255BSRX-K1 (MAC 地址以实际为准)

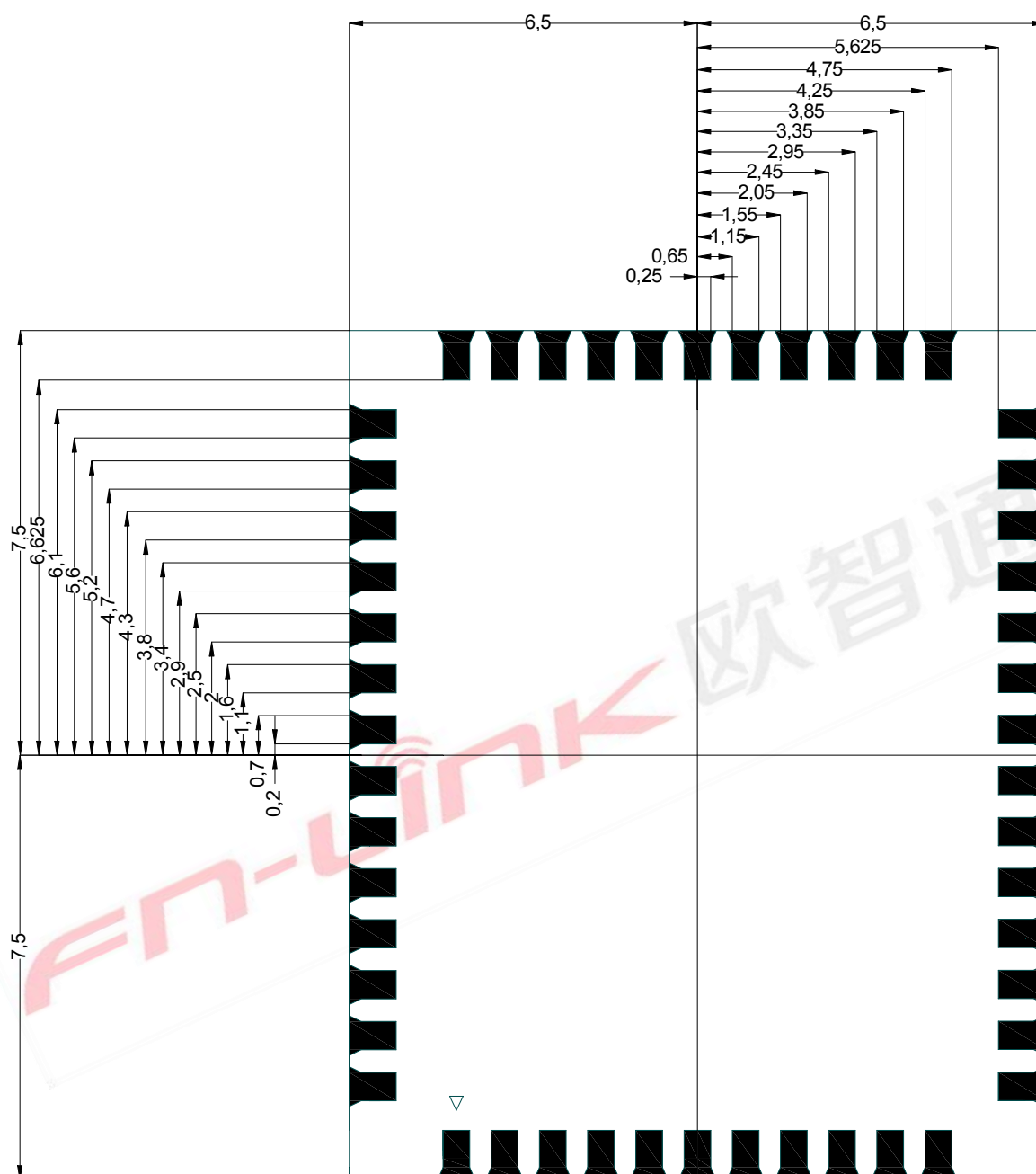
----BT MAC 在 WIFI MAC 基础上+1 (WIFI 地址需跳 1, 不能与 BT 地址重复), 二维码中不显示此内容。

8.3 List of certified information

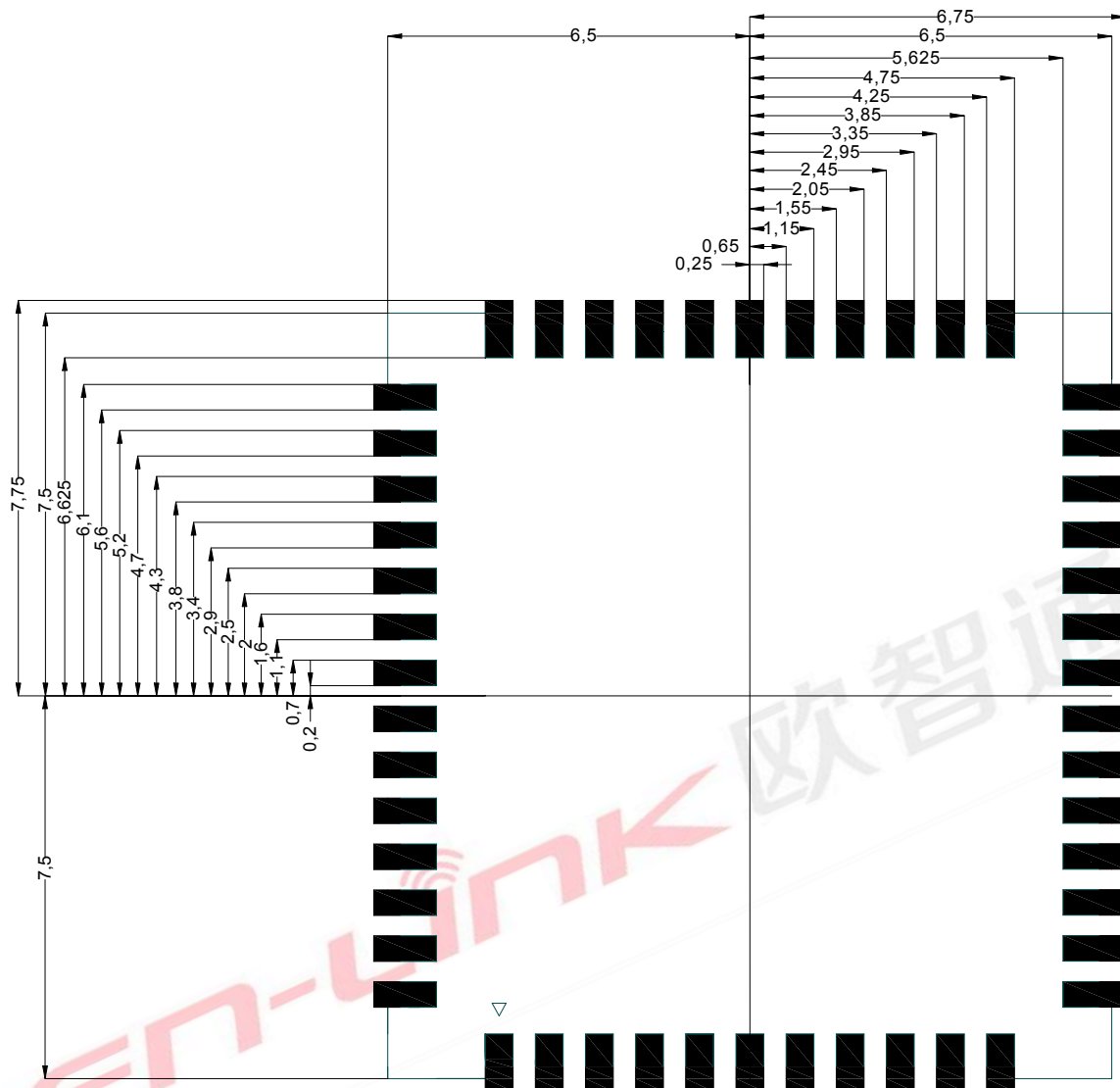
Certification project	Certificate number
SRRC	CMIIT ID:2021AP12648(M)
FCC	2AATL-K255B-SR
CE	HUNA132-EU
IC	TBD
NCC	TBD
KCC	TBD
TELEC	TBD
Brazil	TBD
Argentina	TBD
Japan	TBD

8.4 Physical Dimensions

<TOP View>



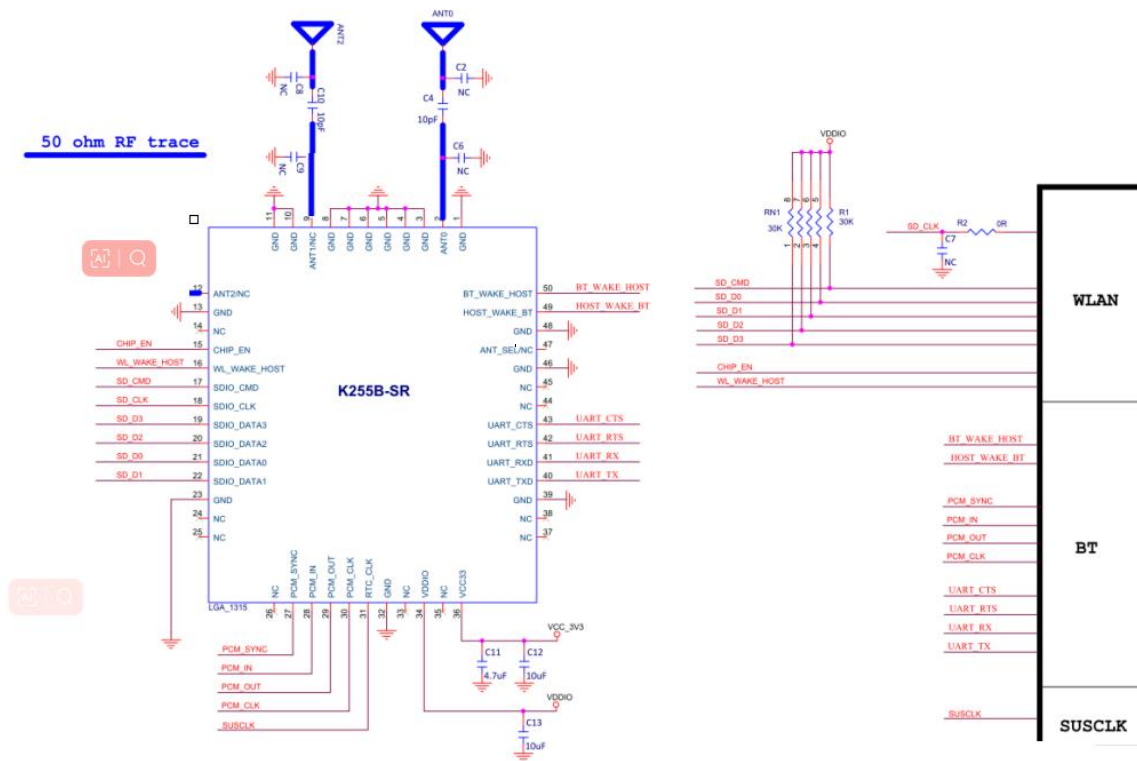
8.4 Layout Recommendation



9. The Key Material List

Item	Part Name	Description	Manufacturer
1	Inductor	2016 2.2uH, $\pm 20\%$	Sunlord, Ceaiya, Cenker
2	Diplexer	1608 Dual-band, dual-mode 2.4GHz/5GHz WLAN	Glead, Walsin, ACX, Murata, MAG.LAYERS, ftrgroup
3	Crystal	2016 40MHz	ECEC, TKD, Hosonic, JWT, TXC
4	Chipset	W155S1	Amlogic
5	PCB	FR4, 4 LAYER, GREEN	XY-PCB, GDKX, Sunlord, SLPCB

10. Reference Design



C11, C12 should be placed close to pin 36 of the module
C13 should be placed close to pin 34 of the module

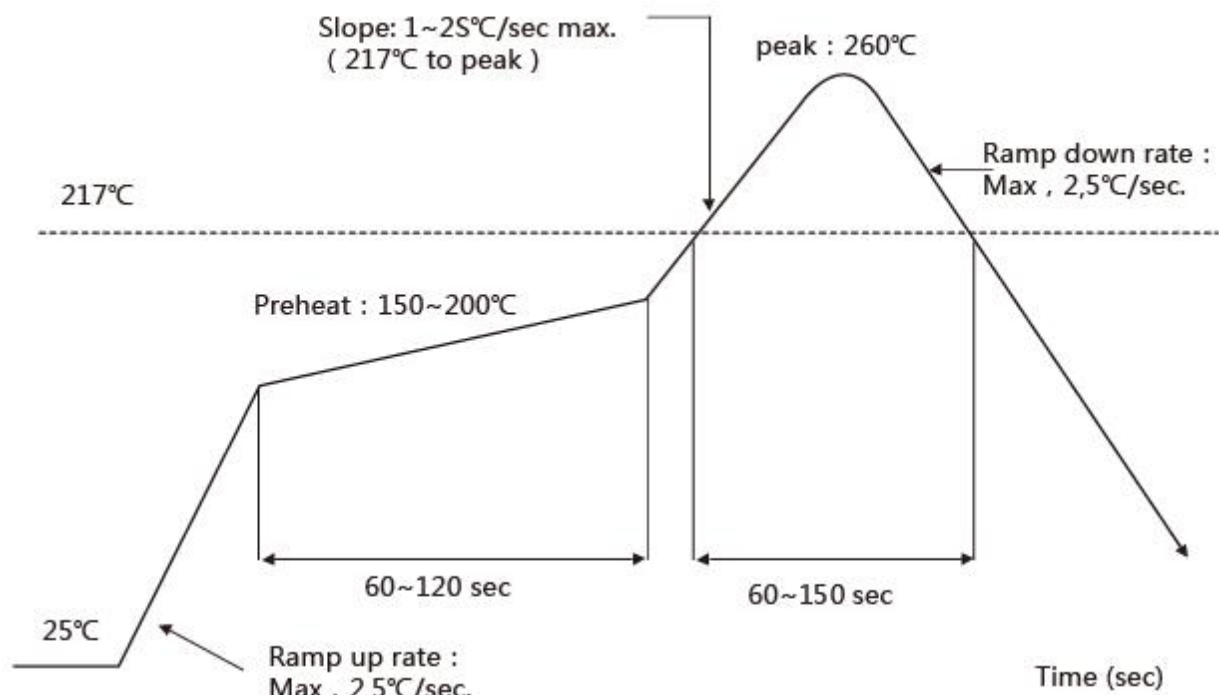
11. Recommended Reflow Profile

Referred to IPC/JEDEC standard.

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

Time within 5°C of peak temperature: $\geq 10\text{s}$

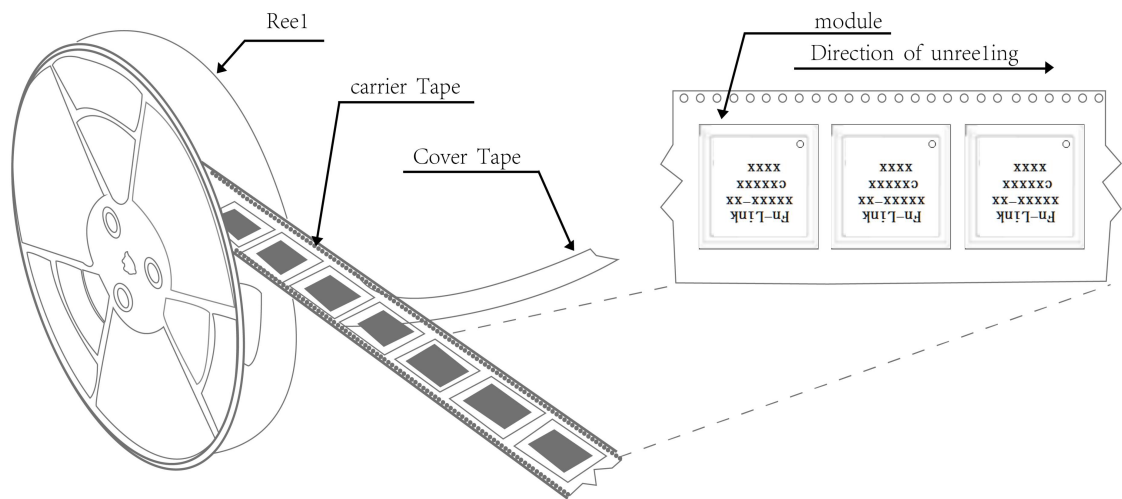
Number of Times : ≤ 2 times



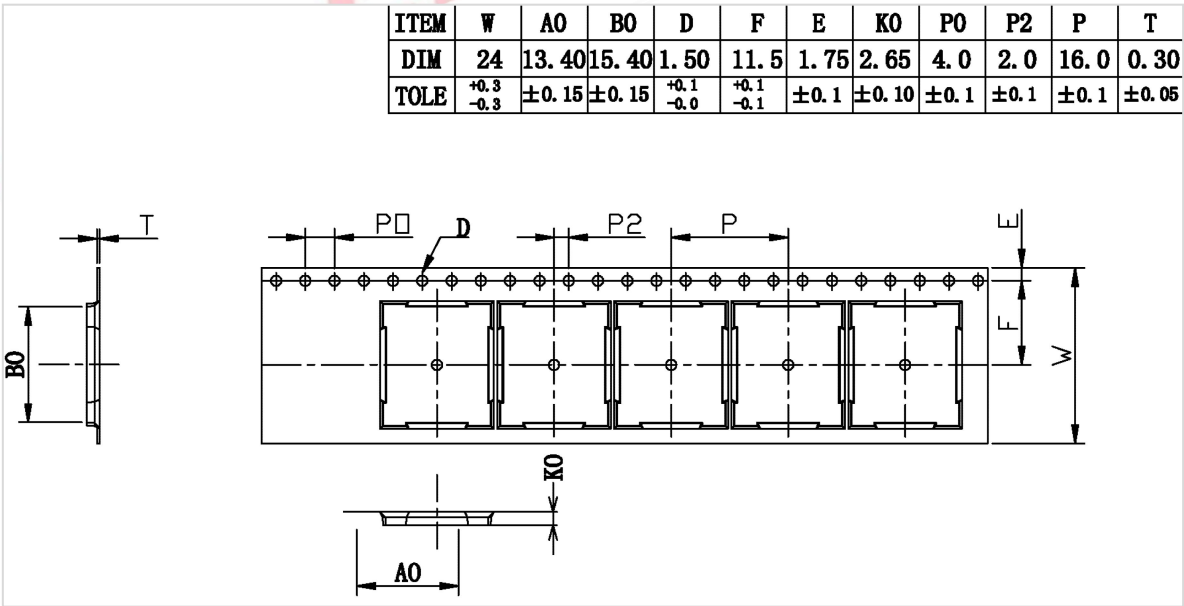
12. Package

12.1 Reel

A roll of 1500pcs



12.2 Carrier Tape Detail



12.3 Packaging Detail

the take-up package



Using self-adhesive tape

Size of black tape: 24mm*24.4m the cover tape :21.3mm*24.4m

Color of plastic disc: blue



NY bag size:450mm*415mm



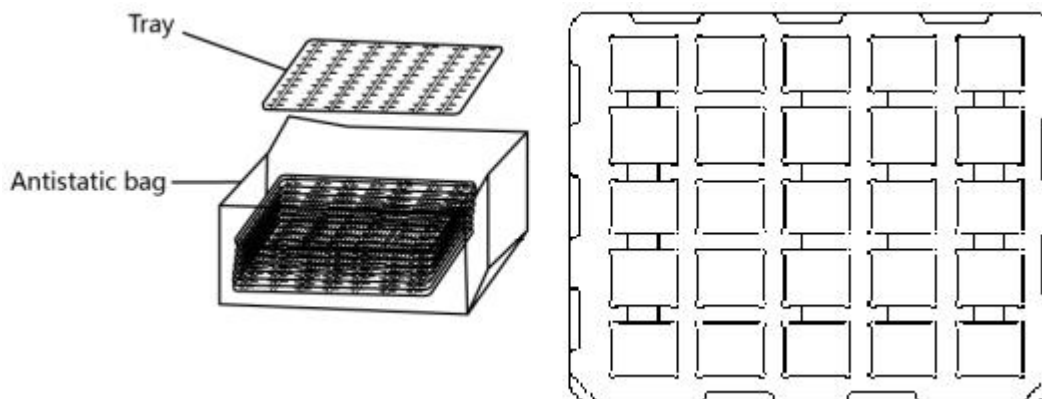
size : 350*350*35mm



The packing case size:360*210*370mm

12.4 Tray

Use pallet packaging for less than 300 pieces



13. 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 $<40^{\circ}\text{C}$ 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
- d) "IPC/JEDEC J-STD-033A paragraph 5.2" is respected
- e) Baking is required if conditions b) or c) are not respected
- f) Baking is required if the humidity indicator inside the bag indicates 10% RH or more