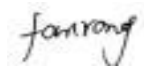



WIFI 2.4GHz&5GHz Module Specification

IEEE 802.11a/b/g/n/ac 1T1R WLAN

Bluetooth 4.2-SDIO/UART Interface

CUSTOMER		CHECKED	APPROVED
	SIGNATURE		
APPROVAL	DATE		
ANRAY		CHECKED	APPROVED
APPROVAL	SIGNATURE	Lujianmei	
VERSION		DATE	2020.10.15
		2020.10.15	2020.10.15

Anray Communication Technology CO.LTD

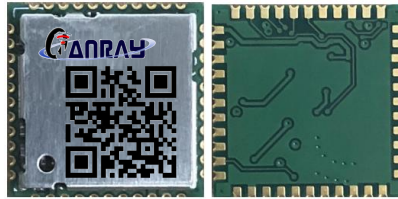
北京偶极通信设备有限责任公司

Contents

1. General description	3
2. Electrical Properties	4~11
2.1 Schematic diagram.....	4
2.2 General Specification.....	4
2.3 Recommended Operating Rating.....	5
2.4 RF Specification.....	6~11
3. Pin Definition	12~13
4. Physical Dimension	14
5. Application circuit diagram	15~16
6. Host Interface Timing Diagram	17~23
7. Recommended SMT temperature	23
8. Package	24

1. General description

1.1 Introduction



P/N: Anray210830602GA01
(Size:12 * 12 * 2.0mm)

Anray 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 Features

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

Supports Bluetooth V4.2+HS, BLE and be backwards compatible with Bluetooth 1.2, 2.X+ enhance data rate.

Supports WLAN-Bluetooth coexistence.

Supports Bluetooth for class1 and class2 power level transmissions without requiring an external PA.

BT host digital interface:

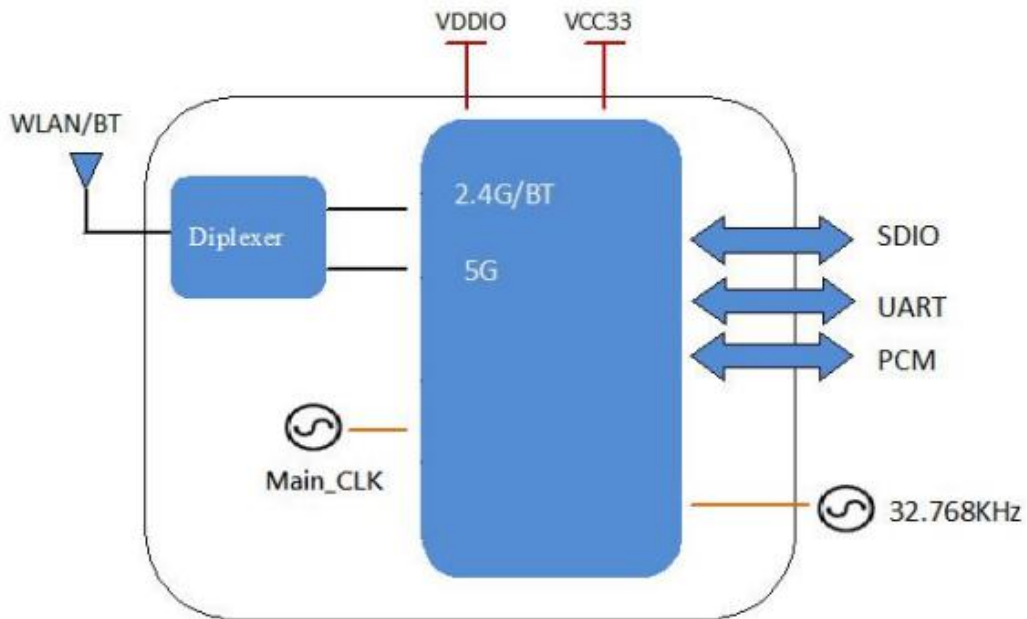
- HCI UART (up to 4 Mbps)
- PCM for audio data

1.3 Application

Wireless terminal, industrial remote sensing, security monitoring, medical equipment, electronic station board, intelligent transportation, etc.

2. Electrical Properties

2.1 Schematic diagram



2.2 General Specification

Model Name	WIFI 2.4GHz&5GHz Module(1T1R)
Product Description	Support Wi-Fi & Bluetooth function
Wi-Fi Interface	Support SDIO V3.0
BT Interface	UART / PCM
Operating temperature	-10°C to +60°C
Storage temperature	-30°C to +85°C
Size:L* W * T(mm)	12 * 12 * 2.0 (typical)
RoHS	All hardware components are fully compliant with EU RoHS directive

2.3 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			

2.4 RF Specification

2.4.1 2.4GHz RF Specification

Feature	Description			
WLAN Standard	IEEE 802.11b/g/n, Wi-Fi compliant			
Frequency Range	2.400 GHz ~ 2.497 GHz (2.4 GHz ISM Band)			
Number of Channels	2.4GHz: Ch1 ~ Ch14			
Modulation	DBPSK/DQPSK/CCK(DSSS)、BPSK/QPSK/16QAM/64QAM(OFDM)			
Spectrum Mask	Min. b/g/n	Typ. b/g/n	Max. b/g/n	Unit b/g/n
1st side lobes(to fc ± 11MHZ)	-	-41/-32/-42	-	dBr
2st side lobes(to fc ± 22MHZ)	-	-50/-31/-52	-	dBr
Freq. Tolerance	-20/-20/-20	-	20/20/20	ppm
Output Power	802.11b /11Mbps : 16 dBm ± 1.5 dB @ EVM ≤ -9dB			
	802.11g /54Mbps : 15 dBm ± 1.5 dB @ EVM ≤ -25dB			
	802.11n /MCS7(HT 20) : 14 dBm ± 1.5 dB @ EVM ≤ -28dB			
	802.11n /MCS7(HT 40) : 14 dBm ± 1.5 dB @ EVM ≤ -28dB			
Test Items	Typical Value		Standard Value	
Receive Sensitivity (11b) @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) @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 (11n,40MHz) @10% PER	- MCS=0	PER @ -87 dBm	≤-82
	- 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

2.4.2 5GHz RF Specification

Feature	Description
WLAN Standard	IEEE 802.11a/n/ac, Wi-Fi compliant
Frequency Range	4.900 GHz ~ 5.845 GHz (5.0 GHz ISM Band)
Number of Channels	5.0GHz: Please see the table ¹
Modulation	802.11a/n : 64-QAM,16-QAM, QPSK, BPSK 802.11ac : 256-QAM, 64-QAM,16-QAM, QPSK, BPSK
Output Power	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 (11n,20MHz) @10% PER	- MCS=0 PER @ -85 dBm	≤-82
	- 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
	- MCS=7 PER @ -62 dBm	≤-61
Receive Sensitivity (11ac,20MHz) @10% PER	- 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
	- MCS=8 PER @ -63 dBm	≤-59

Receive Sensitivity (11ac,40MHz) @10% PER	- 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
	- MCS=9	PER @ -58 dBm	≤-54
Receive Sensitivity (11ac,80MHz) @10% PER	- 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

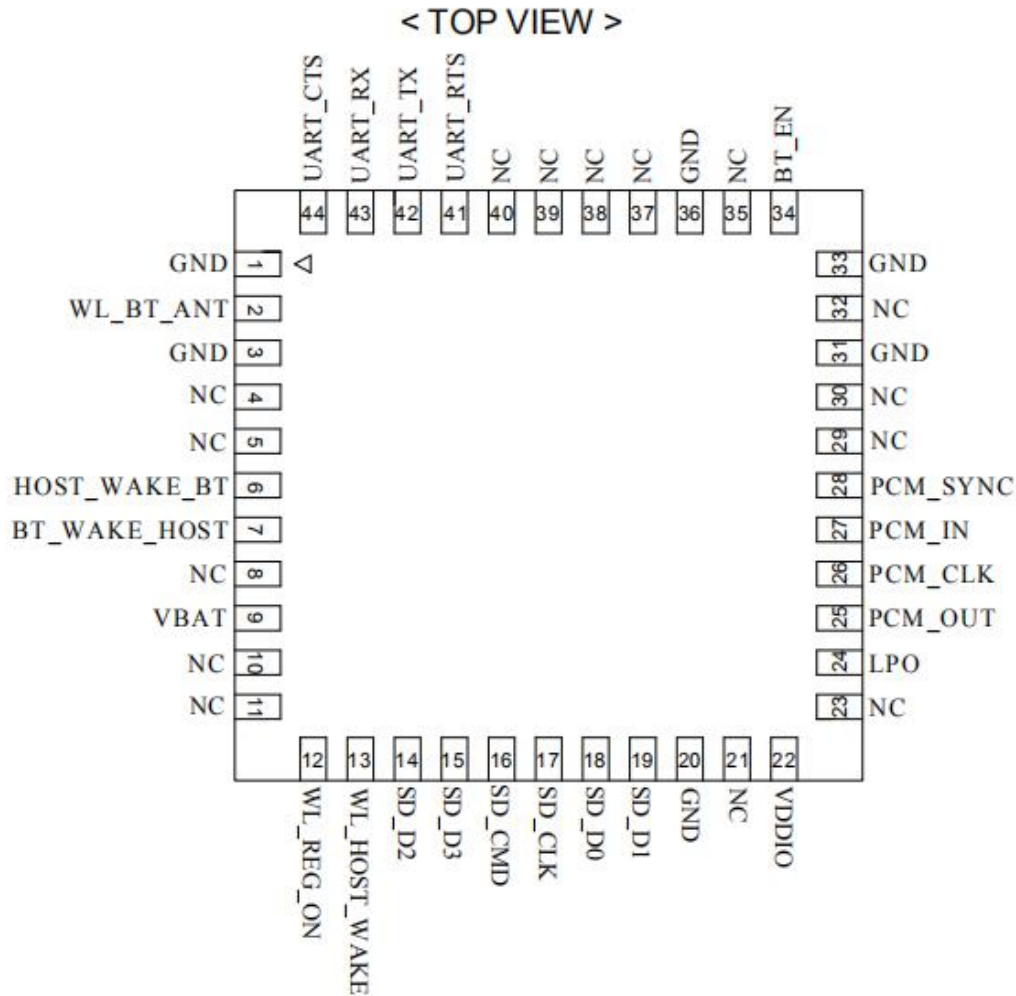
5GHz channel table

Band (GHz)	Operating Channel Numbers	Channel center frequencies(MHz)
5.15GHz~5.25GHz	36	5180
	40	5200
	44	5220
	48	5240
5.25GHz~5.35GHz	52	5260
	56	5280
	60	5300
	64	5320
5.5GHz~5.7GHz	100	5500
	104	5520
	108	5540
	112	5560
	116	5580
	120	5600
	124	5620
	128	5640
	132	5660
	136	5680
5.725GHz~5.825GHz	140	5700
	149	5745
	153	5765
	157	5785
	161	5805
	165	5825

2.4.3 Bluetooth Specification

Feature	Description		
General Specification			
Bluetooth Standard	Bluetooth V4.2 of 1, 2 and 3 Mbps.		
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, 8DPSK		
RF Specification			
	Min.	Typical.	Max.
Output Power	0 dBm		8 dBm
Sensitivity @ BER=0.1% for GFSK (1Mbps)	-85 dBm		-80 dBm
Sensitivity @ BER=0.01% for $\pi/4$ -DQPSK (2Mbps)	-85 dBm		-80 dBm
Sensitivity @ BER=0.01% for 8DPSK (3Mbps)	-85 dBm		-80 dBm
Maximum Input Level	GFSK (1Mbps):-20dBm		
	$\pi/4$ -DQPSK (2Mbps) :-20dBm		
	8DPSK (3Mbps) :-20dBm		

3. Pin Definition



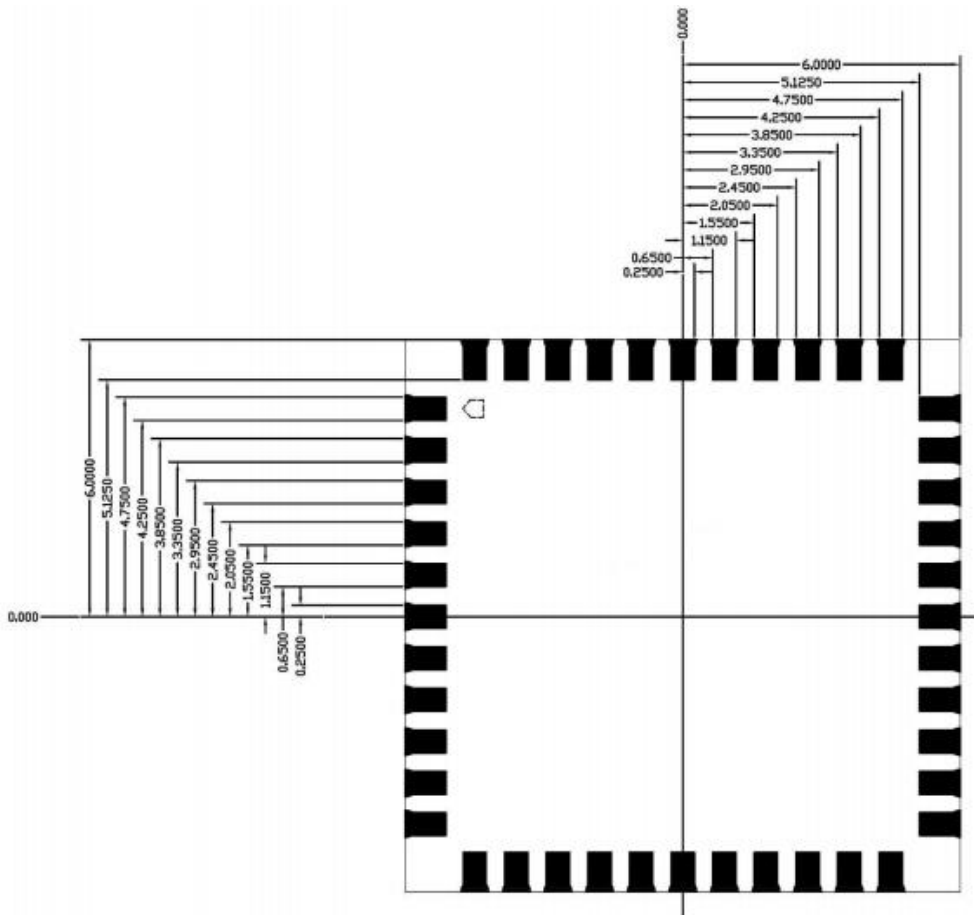
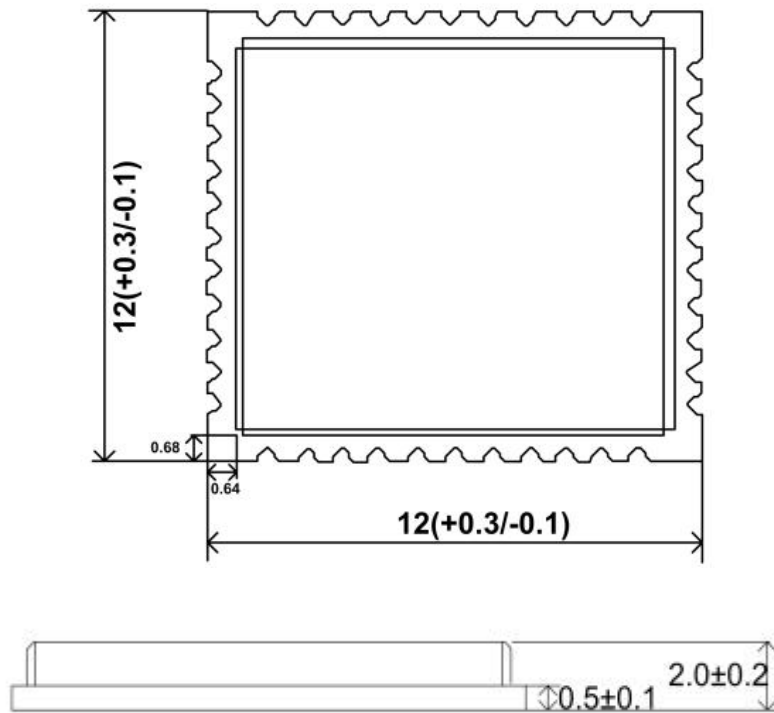
NO	Name	Type	Description	Voltage
1	GND	—	Ground connections	
2	WL_BT_ANT	I/O	RF I/O port	
3	GND	—	Ground connections	
4	NC	—	Floating (Don't connected to ground)	
5	NC	—	Floating (Don't connected to ground)	
6	HOST_WAKE_BT	I	HOST to wake-up Bluetooth device	VDDIO
7	BT_WAKE_HOST	O	Bluetooth device to 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

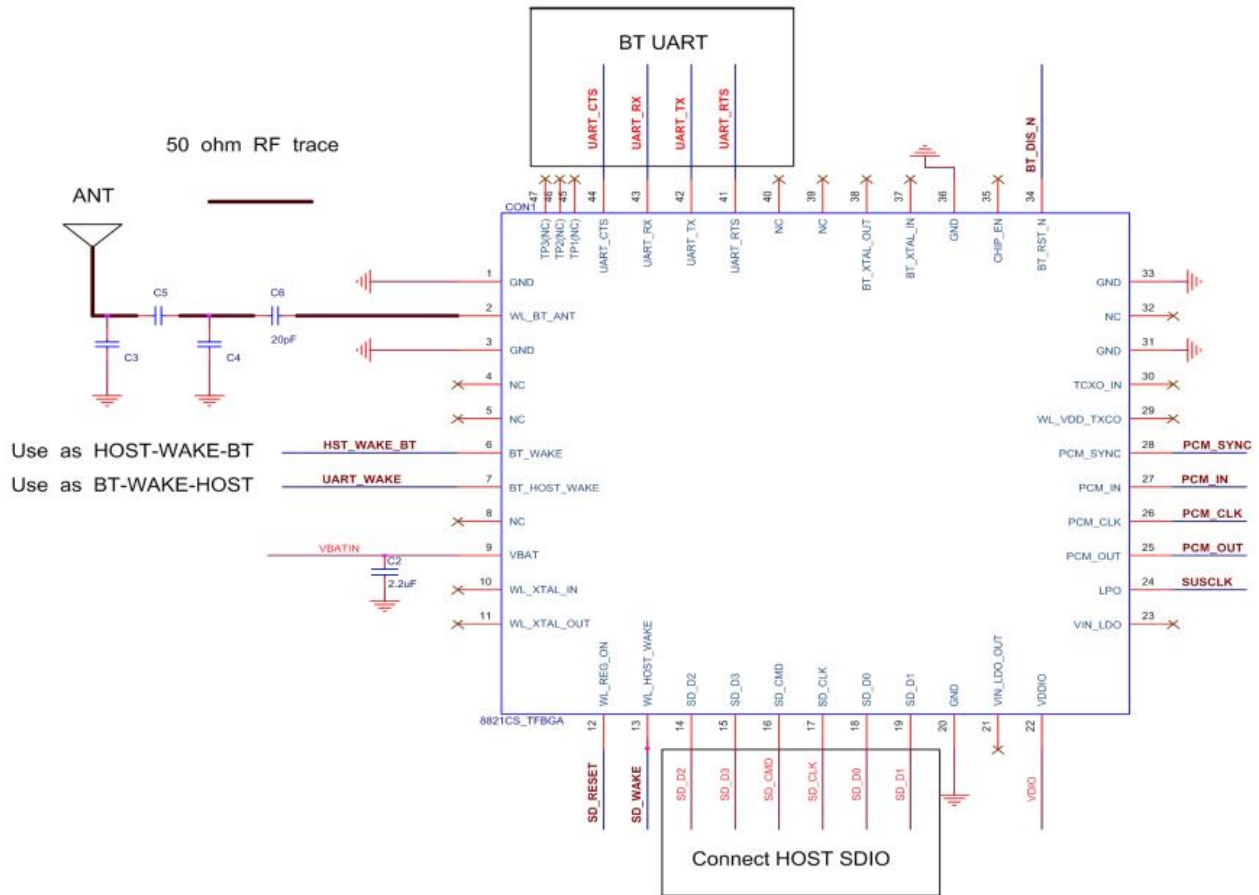
4. Physical Dimension

(Unit: mm)



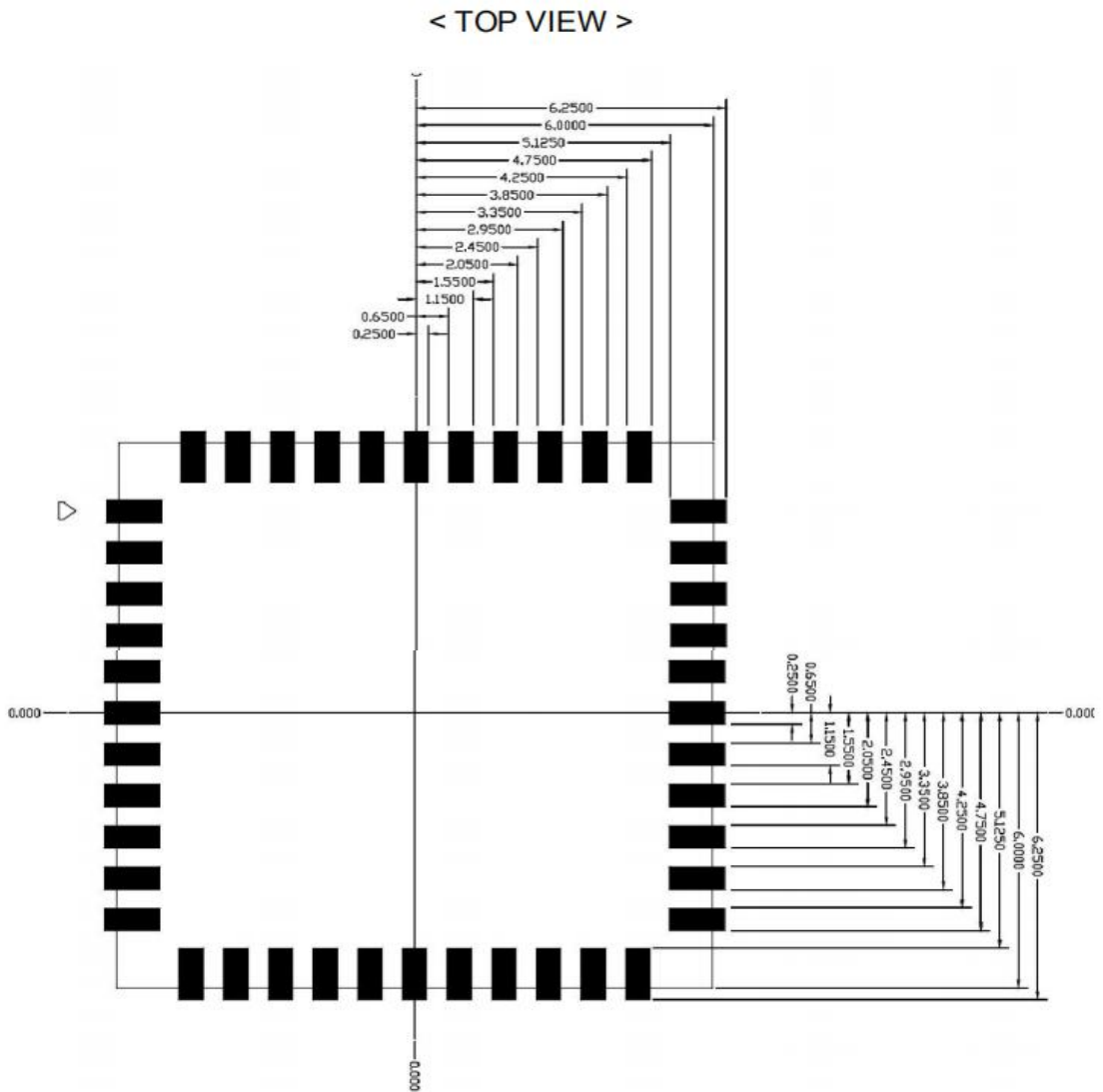
5. Application circuit diagram

5.1 Reference Design



5.2 Reference Dimension

(Unit: mm)



6. Host Interface Timing Diagram

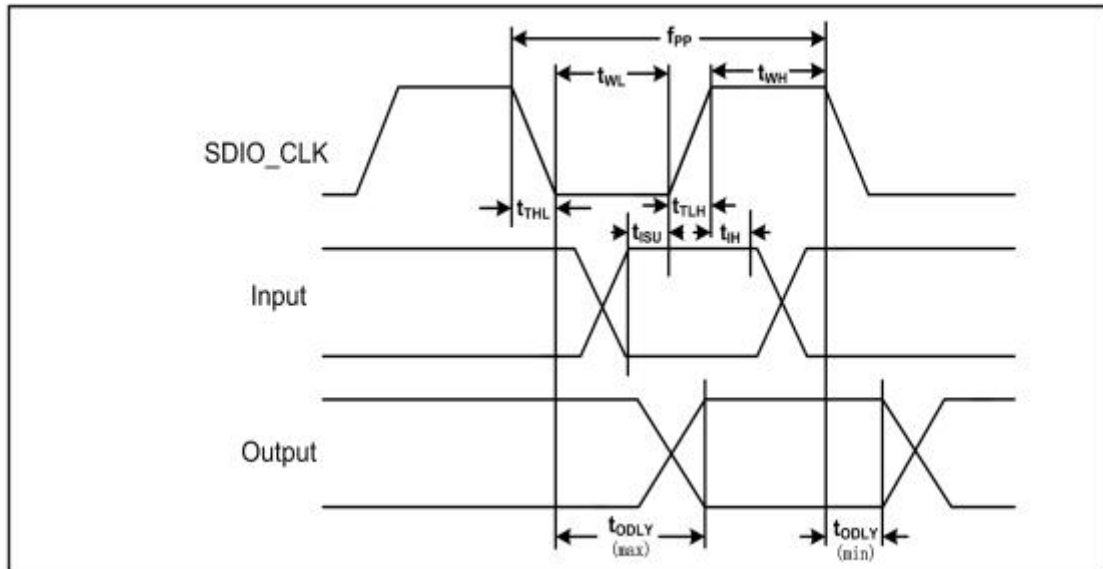
6.1 SDIO Pin Description

The module supports SDIO version 3.0 for all 1.8V 4-bit UHSI speeds: SDR50(100 Mbps), DDR50(50MHz, dual rates) in addition to the 3.3V default speed(25MHz) and high speed (50 MHz). It has the ability to stop the SDIO clock and map the interrupt signal into a GPIO pin. This 'out-of-band' interrupt signal notifies the host when the WLAN device wants to turn on the SDIO interface. The ability to force the control of the gated clocks from within the WLAN chip is also provided.

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

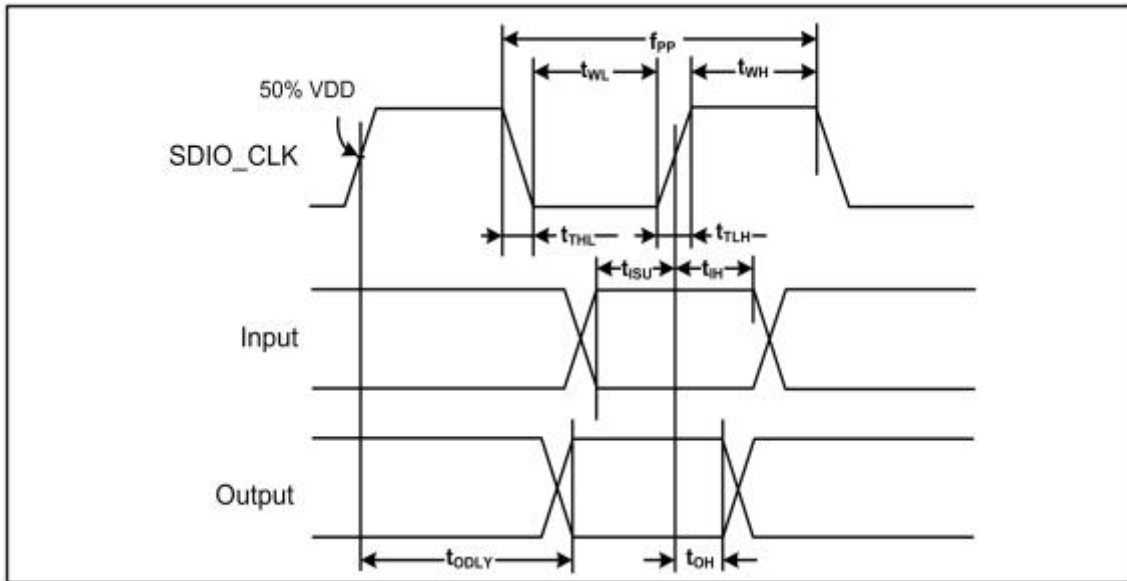
6.2 SDIO Default Mode Timing Diagram



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

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

6.3 SDIO High Speed Mode Timing Diagram

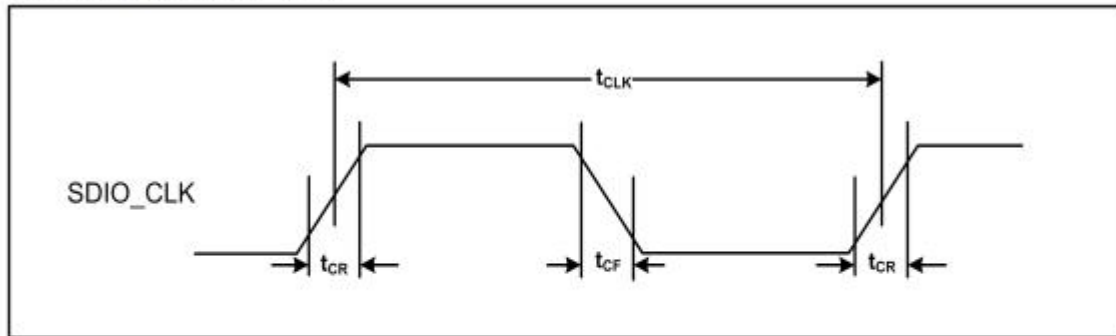


Parameter	Symbol	Minimum	Typical	Maximum	Unit
SDIO CLK(all values are referred to minimum VIH and maximum VIL^b)					
Frequency - Data Transfer mode	fPP	0	-	50	MHz
Frequency - Identification mode	fOD	0	-	400	kHz
Clock low time	tWL	7	-	-	ns
Clock high time	tWH	7	-	-	ns
Clock rise time	tTLH	-	-	3	ns
Clock low time	tTHL	-	-	3	ns
Inputs:CMD, DAT(referenced to CLK)					
Input setup time	tISU	6	-	-	ns
Input hold time	tIH	2	-	-	ns
Outputs:CMD, DAT(referenced to CLK)					
Output delay time - Data Transfer mode	tODLY	-	-	14	ns
Output delay time - Identification mode	tODLY	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. $Min(V_{ih}) = 0.7 \times VDDIO$ and $max(V_{il}) = 0.2 \times VDDIO$.

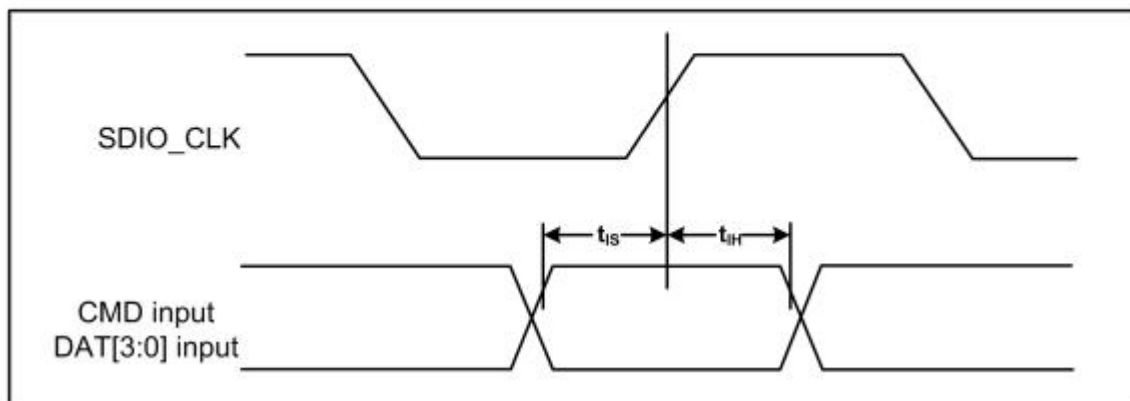
6.4 SDIO Bus Timing Specifications in SDR Modes

Clock timing(SDR Modes)



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

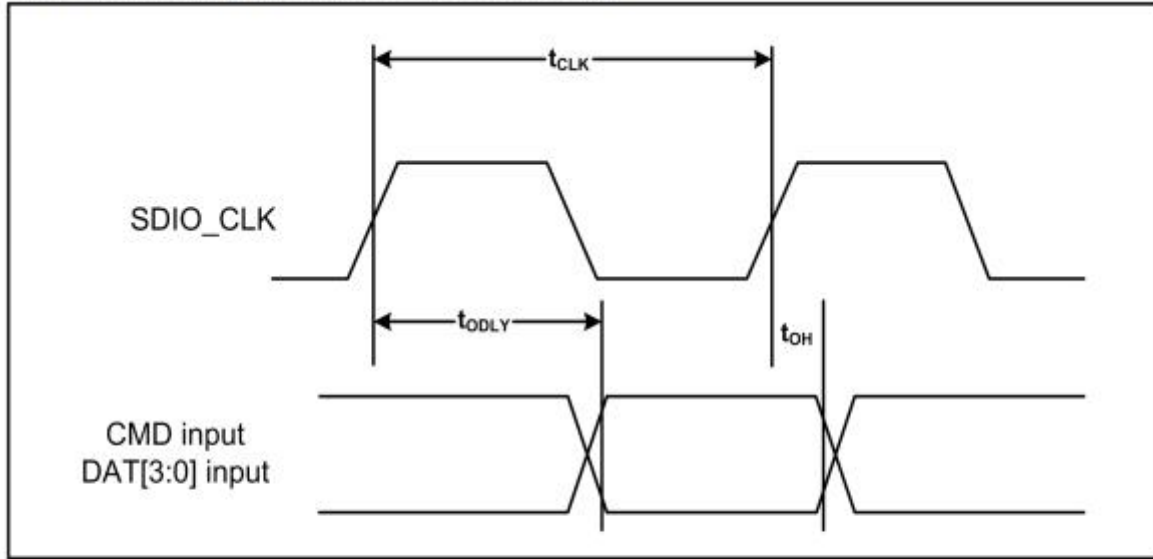
Card Input timing (SDR Modes)



Symbol	Minimum	Maximum	Unit	Comments
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.

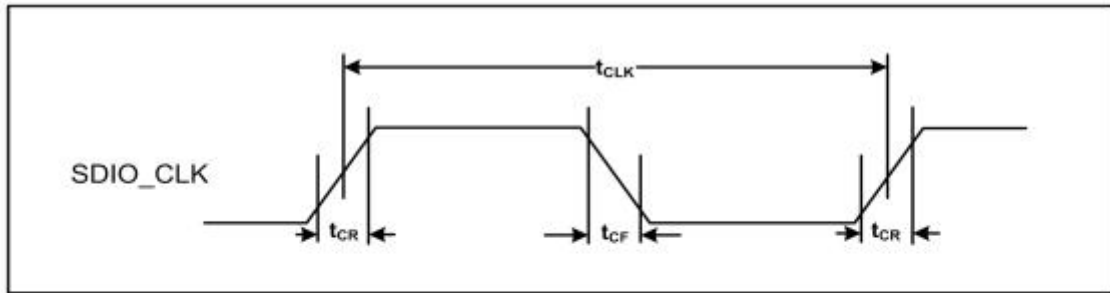
Card output timing (SDR Modes up to 100MHz)



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 $t_{ODLY}(\min)$ $CL = 15$ pF

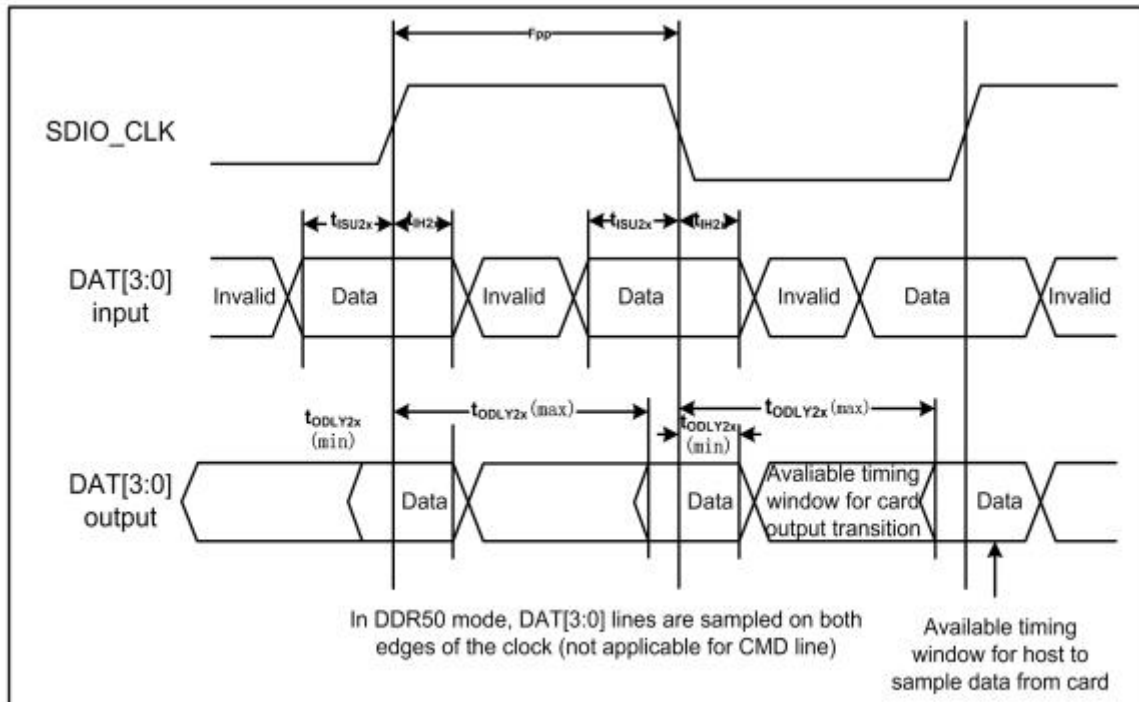
a. SDIO 3.0 specification value is 7.5 ns.

6.5 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 pF (1 Card)
Input hold time	t _{IH2x}	0.8	-	ns	C _{CARD} < 10 pF (1 Card)
Output CMD					
Output delay time	t _{ODLY2x}	-	7.85 ^a	ns	C _{CARD} < 25 pF (1 Card)
Output hold time	t _{ODLY2x}	1.5	-	ns	C _{CARD} < 15 pF (1 Card)

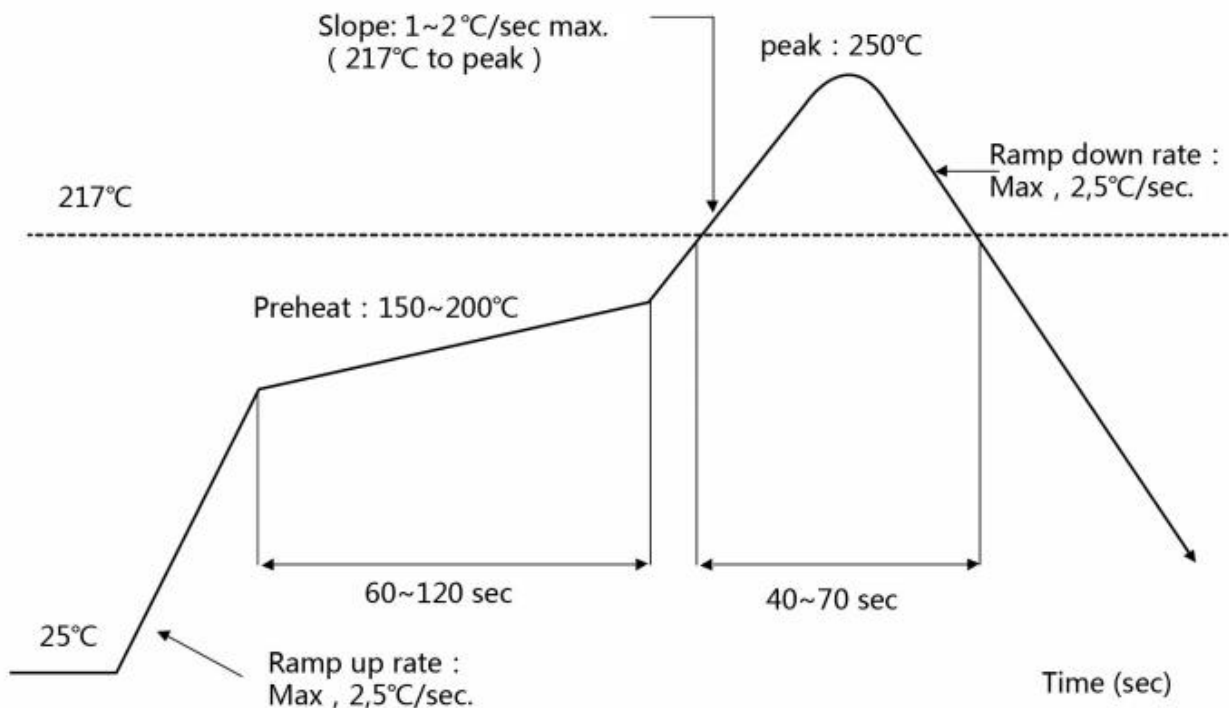
a. SDIO 3.0 specification value is 7.0 ns

7. Recommended SMT temperature

Referred to IPC/JEDEC standard.

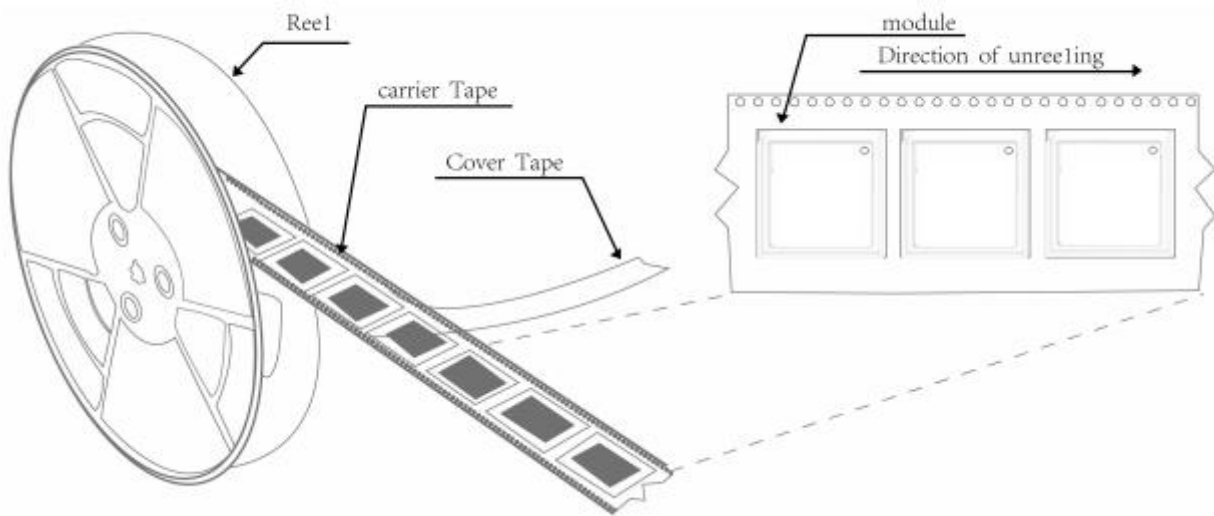
Peak Temperature : <250°C

Number of Times : ≤2 times



8. Package

Using self-adhesive tape, A roll of 2000pcs.



BOX