

User Manual-Integration Instructions

■ Highlights

- **IEEE 802.11 Key Feature**

- TX and RX low-density parity check (LDPC) support for improved range and power efficiency.
- 802.11 a/b/g/n/ac, Dual-stream spatial multiplexing up to 867 Mbps data rate.
- 20, 40, 80 MHz channels with optional SGI (256 QAM modulation)
- Real simultaneous dual-band

■ Applications

- Health & fitness equipment including heart rate monitors, blood pressure, weight scales, thermometers
- Control, automation, security and Alliance for Wireless Power wireless charging
- Consumer: toys, robots, remote controls
- Location, proximity detection
- And more...

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1. Introduction

1.1 Overview

The Alinket ALXC29 is a fully Wi-Fi functionalities module with seamless roaming capabilities and advance security, also it could interact with different vendors' 802.11a/b/g/n/ac 2x2 Access Points with MIMO standard and can accomplish up to speed of 867Mbps with dual stream in 802.11n to connect the wireless LAN. Furthermore ALXC29 included SDIO interface for Wi-Fi.

In addition, this compact module is a total solution for a combination of Wi-Fi technologies. The module is specifically developed for tablet, OTT box and portable devices.

1.2 Product Features

IEEE 802.11 Key Feature

- Lead Free design which is compliant with ROHS requirements.
- TX and RX low-density parity check (LDPC) support for improved range and power efficiency.
- Dual-stream spatial multiplexing up to 867 Mbps data rate.
- 20, 40, 80 MHz channels with optional SGI (256 QAM modulation)
- Real simultaneous dual-band
- Supports 2 antennas for WLAN port.
 - Supports standard SDIO v3.0, compatible with SDIO v2.0 HOST interfaces.

2. General Specification

2.1 General Specification

Model Name	ALXC29
Product Description	2T2R 802.11 a/b/g/n/ac Wi-Fi 5.0 Module
Dimension	L x W : 15 x 13 (typical) mm, H : 1.6 (Maximum) mm
WiFi Interface	Support SDIO V3.0/2.0
Operating temperature	-30°C to 75°C
Storage temperature	-40°C to 85°C
Humidity	Operating Humidity 10% to 95% Non-Condensing

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Note: The optimal RF performance specified in the data sheet, however, is guaranteed only -10 °C to +55 °C and 3.2V < VBAT < 3.8V without derating performance.

2.2 DC Characteristics

2.2.1 Absolute Maximum Ratings

Symbol	Description	Min.	Max.	Unit
VBAT	Input supply Voltage	-0.5	4.5	V
VDDIO	Digital/SDIO/ I/O Voltage	-0.5	3.8	V

2.2.2 Recommended Operating Rating

The module requires two power supplies: VBAT and VDDIO.

Voltage rails	Min.	Typ.	Max.	Unit
VBAT	3.0	3.3	3.8	V
VDDIO	1.7	1.8,3.3	3.6	V

VBAT current consumption 1200mA(Peak), when VBAT = 3.3V

3. Wi-Fi RF Specification

3.1 2.4GHz RF Specification

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

Feature		Description			
WLAN Standard		IEEE 802.11b/g/n & Wi-Fi compliant			
Frequency Range		2.400 GHz ~ 2.497 GHz (2.4GHz ISM Band)			
Number of Channels		2.4GHz : Ch1 ~ Ch14			
Modulation		802.11b : DQPSK、DBPSK、CCK 802.11 g/n : OFDM /64QAM、16QAM、QPSK、BPSK			
Output Power , tolerance ± 1.5 dB					
The transmit EVM quality & spectrum mask are compliant with IEEE 802.11 standard					
802.11b	1Mbps	2Mbps	5.5Mbps	11Mbps	
	17.5	17.5	17.5	17.5	
802.11g	6、9Mbps	12、18Mbps	24Mbps	36Mbps	48Mbps
	17.5	17.5	17	17	16.5
	54Mbps				

	16.5				
802.11n 20MHz	MCS0~2	MCS3	MCS4	MCS5	MCS6
	17.5	16.5	16.5	16	16
	MCS7				
	15.5				
Note: The specifications of RF output power are subject to change to fulfill the safety regulation and requirements in end-user product.					
Sensitivity, tolerance ± 2 dB CCK modulation PER $\leq 8\%$、OFDM modulation PER $\leq 10\%$					
802.11b	Data Rate	Spec.(dBm)			
	1Mbps	-96			
	2Mbps	-93			
	5.5Mbps	-91			
	11Mbps	-88			
802.11g SISO	Data Rate	Spec.(dBm)	Data Rate	Spec.(dBm)	
	6Mbps	-92	24Mbps	-84	
	9Mbps	-91	36Mbps	-81	
	12Mbps	-90	48Mbps	-78	
	18Mbps	-87	54Mbps	-76	
802.11g MIMO	Data Rate	Spec.(dBm)	Data Rate	Spec.(dBm)	
	6Mbps	-95	24Mbps	-87	
	9Mbps	-94	36Mbps	-84	
	12Mbps	-93	48Mbps	-81	
	18Mbps	-90	54Mbps	-78	
802.11n_20MHz SISO	Data Rate	Spec.(dBm)	Data Rate	Spec.(dBm)	
	MCS0	-91	MCS4	-80	
	MCS1	-89	MCS5	-78	
	MCS2	-87	MCS6	-76	
	MCS3	-78	MCS7	-74	
802.11n_20MHz MIMO	Data Rate	Spec.(dBm)	Data Rate	Spec.(dBm)	
	MCS0	-93	MCS5	-80	
	MCS1	-92	MCS6	-78	
	MCS2	-90	MCS7	-76	
	MCS3	-87	MCS8	-72	
	MCS4	-83	MCS15	-73	
Maximum Input Level	802.11b : -10 dBm				
	802.11g/n : -20 dBm				

3.2 5GHz RF Specification

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

Feature		Description			
WLAN Standard		IEEE 802.11a/n/ac & Wi-Fi compliant			
Frequency Range		5.15~5.35GHz、 5.47~5.725GHz、 5.725~5.85GHz (5GHz UNII Band)			
Number of Channels		5.15~5.35GHz: Ch36 ~ Ch64			
		5.47~5.725GHz: Ch100 ~ Ch140			
		5.725~5.85GHz: Ch149 ~ Ch165			
Modulation		802.11a : OFDM /64QAM、 16QAM、 QPSK、 BPSK			
		802.11n : OFDM /64QAM、 16QAM、 QPSK、 BPSK			
		802.11ac : OFDM /256QAM、 OFDM /64QAM、 16QAM、 QPSK、 BPSK			
Output Power , tolerance ± 1.5 dB					
The transmit EVM quality & spectrum mask are compliant with IEEE 802.11 standard					
802.11a	Frequency (MHz)	6~9Mbps	12~18Mbps	24Mbps	36Mbps
	5150~5350	16.5	16.5	16	16
	5470~5720	16.5	16.5	16	16
	5725~5845	16.5	16.5	16	16
	Frequency (MHz)	48Mbps	54Mbps		
	5150~5350	15.5	15.5		
	5470~5720	15.5	15.5		
	5725~5845	15.5	15.5		
802.11n 20MHz	Frequency (MHz)	MCS0~2	MCS3	MCS4	MCS5
	5150~5350	16	16	15.5	15.5
	5470~5720	16	16	15.5	15.5
	5725~5845	16	16	15.5	15.5
	Frequency (MHz)	MCS6	MCS7		
	5150~5350	14.5	14.5		
	5470~5720	14.5	14.5		
	5725~5845	14.5	14.5		
802.11n 40MHz	Frequency (MHz)	MCS0~2	MCS3	MCS4	MCS5
	5150~5350	16	16	15.5	15.5
	5470~5720	16	16	15.5	15.5
	5725~5845	16	16	15.5	15.5
	Frequency (MHz)	MCS6	MCS7		
	5150~5350	14.5	14.5		
	5470~5720	14.5	14.5		
	5725~5845	14.5	14.5		
802.11ac 20MHz	Frequency (MHz)	MCS0~2	MCS3	MCS4	MCS5
	5150~5350	16	16	15.5	15.5
	5470~5720	16	16	15.5	15.5
	5725~5845	16	16	15.5	15.5

	Frequency (MHz)	MCS6	MCS7	MCS8	
	5150~5350	14.5	14.5	12	
	5470~5720	14.5	14.5	12	
	5725~5845	14.5	14.5	12	
802.11ac 40MHz	Frequency (MHz)	MCS0~2	MCS3	MCS4	MCS5
	5150~5350	16	16	15.5	15.5
	5470~5720	16	16	15.5	15.5
	5725~5845	16	16	15.5	15.5
	Frequency (MHz)	MCS6	MCS7	MCS8	MCS9
	5150~5350	14.5	14.5	12	10
	5470~5720	14.5	14.5	12	10
	5725~5845	14.5	14.5	12	10
802.11ac 80MHz	Frequency (MHz)	MCS0~2	MCS3	MCS4	MCS5
	5150~5350	15	15	14	14
	5470~5720	15	15	14	14
	5725~5845	15	15	14	14
	Frequency (MHz)	MCS6	MCS7	MCS8	MCS9
	5150~5350	13	13	12	10
	5470~5720	13	13	12	10
	5725~5845	13	13	12	10

Note: The specifications of RF output power are subject to change to fulfill the safety regulation and requirements in end-user product.

Sensitivity, tolerance ± 1.5 dB				
CCK modulation PER $\leq 8\%$ 、OFDM modulation PER $\leq 10\%$				
802.11a SISO	Data Rate	Spec.(dBm)	Data Rate	Spec.(dBm)
	6Mbps	-91	24Mbps	-83
	9Mbps	-90	36Mbps	-80
	12Mbps	-88	48Mbps	-76
	18Mbps	-86	54Mbps	-74
	Data Rate	Spec.(dBm)	Data Rate	Spec.(dBm)
802.11a MIMO	6Mbps	-92	24Mbps	-86
	9Mbps	-91	36Mbps	-83
	12Mbps	-90	48Mbps	-78
	18Mbps	-89	54Mbps	-77
802.11n_20MHz SISO	Data Rate	Spec.(dBm)	Data Rate	Spec.(dBm)
	MCS0	-90	MCS4	-79
	MCS1	-88	MCS5	-76
	MCS2	-86	MCS6	-73
	MCS3	-83	MCS7	-72
802.11n_20MHz MIMO	Data Rate	Spec.(dBm)	Data Rate	Spec.(dBm)
	MCS0	-92	MCS5	-78

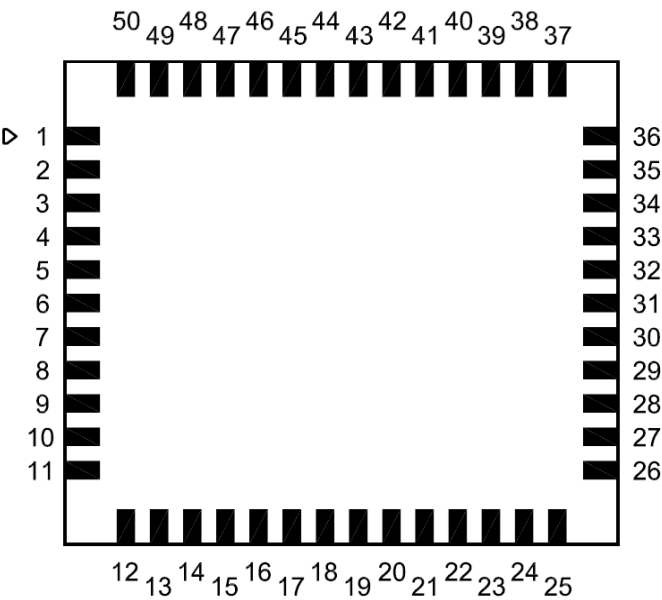
	MCS1	-91	MCS6	-76
	MCS2	-89	MCS7	-75
	MCS3	-86	MCS8	-89
	MCS4	-82	MCS15	-70
802.11n_40MHz SISO	Data Rate	Spec.(dBm)	Data Rate	Spec.(dBm)
	MCS0	-88	MCS4	-77
	MCS1	-86	MCS5	-72
	MCS2	-83	MCS6	-70
	MCS3	-80	MCS7	-69
802.11n_40MHz MIMO	Data Rate	Spec.(dBm)	Data Rate	Spec.(dBm)
	MCS0	-88	MCS5	-75
	MCS1	-88	MCS6	-73
	MCS2	-86	MCS7	-72
	MCS3	-83	MCS8	-86
	MCS4	-79	MCS15	-67
802.11ac_20MHz SISO	Data Rate	Spec.(dBm)	Data Rate	Spec.(dBm)
	MCS0	-90	MCS5	-75
	MCS1	-88	MCS6	-73
	MCS2	-86	MCS7	-70
	MCS3	-83	MCS8	-67
	MCS4	-79		
802.11ac_20MHz MIMO	Data Rate	Spec.(dBm)	Data Rate	Spec.(dBm)
	MCS0,NSS=1	-92	MCS6,NSS=1	-76
	MCS1,NSS=1	-91	MCS7,NSS=1	-75
	MCS2,NSS=1	-88	MCS8,NSS=1	-72
	MCS3,NSS=1	-85	MCS0,NSS=2	-88
	MCS4,NSS=1	-82	MCS8,NSS=2	-65
	MCS5,NSS=1	-77		
802.11ac_40MHz SISO	Data Rate	Spec.(dBm)	Data Rate	Spec.(dBm)
	MCS0	-88	MCS5	-72
	MCS1	-86	MCS6	-70
	MCS2	-83	MCS7	-69
	MCS3	-80	MCS8	-65
	MCS4	-76	MCS9	-63
802.11ac_40MHz MIMO	Data Rate	Spec.(dBm)	Data Rate	Spec.(dBm)
	MCS0,NSS=1	-90	MCS6,NSS=1	-73
	MCS1,NSS=1	-88	MCS7,NSS=1	-72

	MCS2,NSS=1	-86	MCS8,NSS=1	-68
	MCS3,NSS=1	-82	MCS9,NSS=1	-66
	MCS4,NSS=1	-79	MCS0,NSS=2	-86
	MCS5,NSS=1	-77	MCS9,NSS=2	-60
802.11ac_80MHz SISO	Data Rate	Spec.(dBm)	Data Rate	Spec.(dBm)
	MCS0	-85	MCS5	-68
	MCS1	-82	MCS6	-67
	MCS2	-79	MCS7	-65
	MCS3	-76	MCS8	-62
	MCS4	-73	MCS9	-60
802.11ac_80MHz MIMO	Data Rate	Spec.(dBm)	Data Rate	Spec.(dBm)
	MCS0,NSS=1	-87	MCS6,NSS=1	-70
	MCS1,NSS=1	-85	MCS7,NSS=1	-68
	MCS2,NSS=1	-82	MCS8,NSS=1	-66
	MCS3,NSS=1	-79	MCS9,NSS=1	-63
	MCS4,NSS=1	-76	MCS0,NSS=2	-83
	MCS5,NSS=1	-71	MCS9,NSS=2	-58
Maximum Input Level	802.11a/n/ac : -30 dBm			

4. Pin Definition

4.1 Pin Outline

<TOP VIEW>



4.2 Pin Assignment

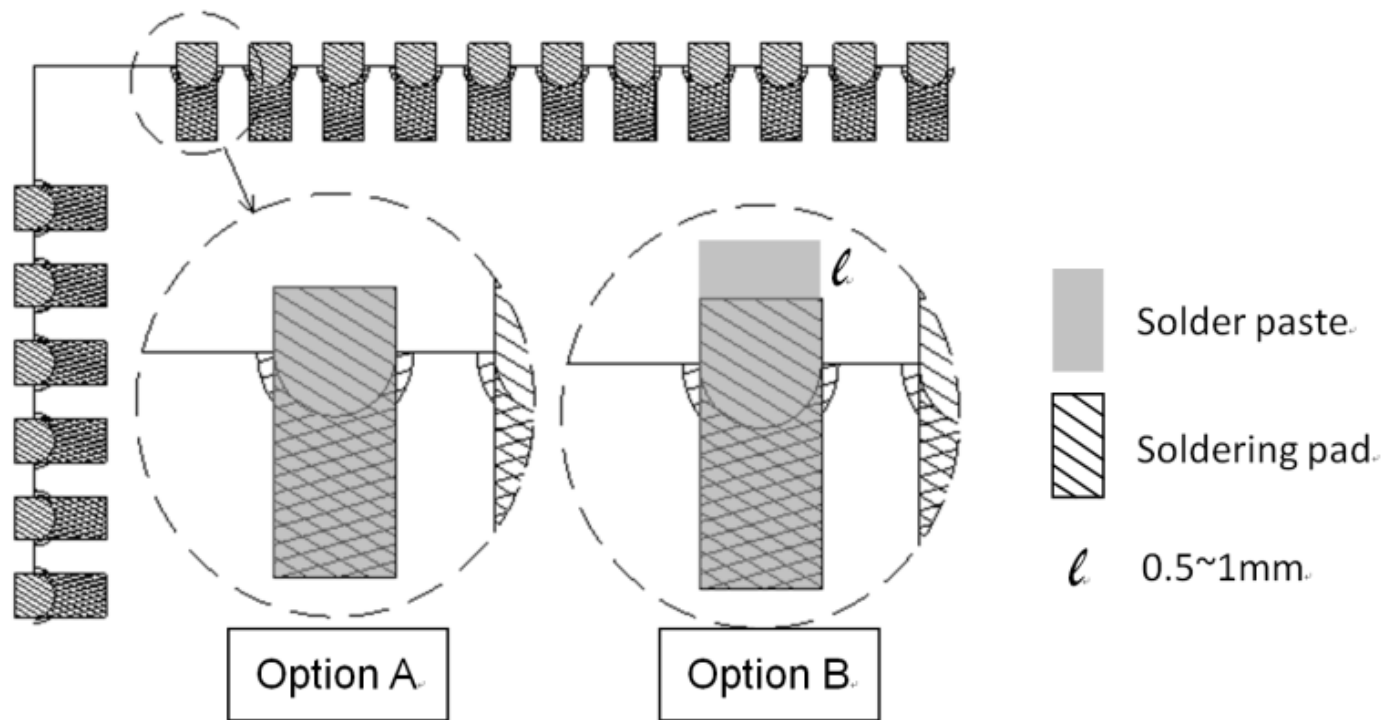
NO	Name	Type	Description
1	GND	—	Ground connections
2	WL_ANT0	I/O	RF(WIFI) I/O port0
3	GND	—	Ground connections
4	GND	—	Ground connections
5	GND	—	Ground connections
6	GND	—	Ground connections
7	GND	—	Ground connections
8	GND	—	Ground connections
9	WL_ANT1	I/O	RF(WIFI) I/O port1
10	GND	—	Ground connections
11	GND	—	Ground connections
12	NC	—	Floating (Don't connected to ground)
13	XTAL_OUT	O	External Crystal out
14	XTAL_IN	I	External Crystal in/ Single clock source in
15	WL_REG_ON	I	Low asserting reset for WiFi core
16	WL_HOST_WAKE	O	WLAN to wake-up HOST
17	SDIO_DATA_CMD	I/O	SDIO command line
18	SDIO_DATA_CLK	I/O	SDIO clock line
19	SDIO_DATA_3	I/O	SDIO data line 3
20	SDIO_DATA_2	I/O	SDIO data line 2
21	SDIO_DATA_0	I/O	SDIO data line 0
22	SDIO_DATA_1	I/O	SDIO data line 1
23	GND	-	Ground connections
24	SDIO_VSEL	I	SDIO voltage select 0:3.3V 1:1.8V
25	VIN_LDO	P	Internal Buck voltage generation pin
26	VIN_LDO_OUT	P	Internal Buck voltage generation pin
27	PCM_SYNC	I/O	PCM sync signal
28	PCM_IN	I	PCM data input
29	PCM_OUT	O	PCM Data output
30	PCM_CLK	I/O	PCM clock
31	LPO	I	External Low Power Clock input (32.768KHz)
32	GND	-	Ground connections

33	NC	-	Floating (Don't connected to ground)
34	VDDIO	P	I/O Voltage supply input
35	NC	-	Floating (Don't connected to ground)
36	VBAT	P	Main power voltage source input
37	NC	-	Floating (Don't connected to ground)
38	NC	-	
39	GND	-	Ground connections
40	NC	-	
41	NC	-	
42	NC	-	
43	NC	-	
44	NC	-	
45	NC	-	
46	NC	-	
47	GND	-	Ground connections
48	NC	-	
49	NC	-	
50	NC	-	

If soldering quality with good wetting on upright side is essential for PQC, how to optimize the

aperture design in the stencil to adjust the amount of solder paste would be crucial.

In addition, a kind of stencil design with stepped thickness in partial area would be considered if the thickness of stencil is about 0.1mm or thinner. Please optimize the stencil design by manufacture engineer or contact Alinket FAE for assistance.



6. External clock reference

External LPO signal characteristics

Parameter	Specification	Units
Nominal input frequency	32.768	kHz
Frequency accuracy	+/-30	ppm
Duty cycle	30 - 70	%
Input signal amplitude	1600 to 3300	mV, p-p
Signal type	Square-wave or sine-wave	-
Input impedance	>100k	Ω
	<5	pF
Clock jitter (integrated over 300Hz – 15KHz)	<1	Hz
Output high voltage	0.7Vio - Vio	V

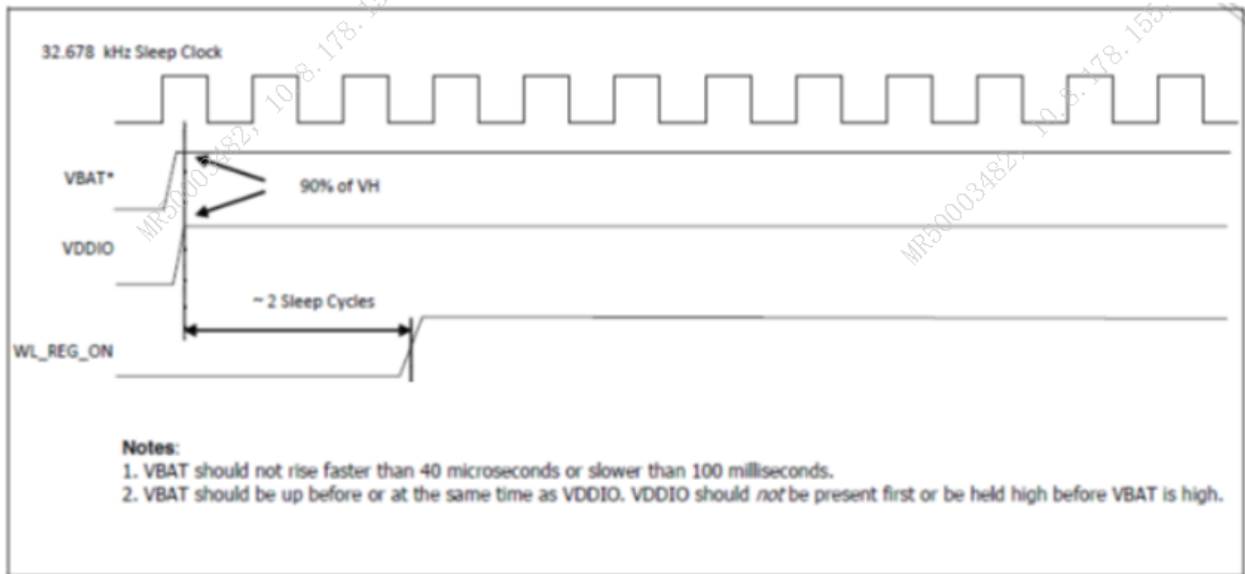
7. Host Interface Timing Diagram

7.1 Power-up Sequence Timing Diagram

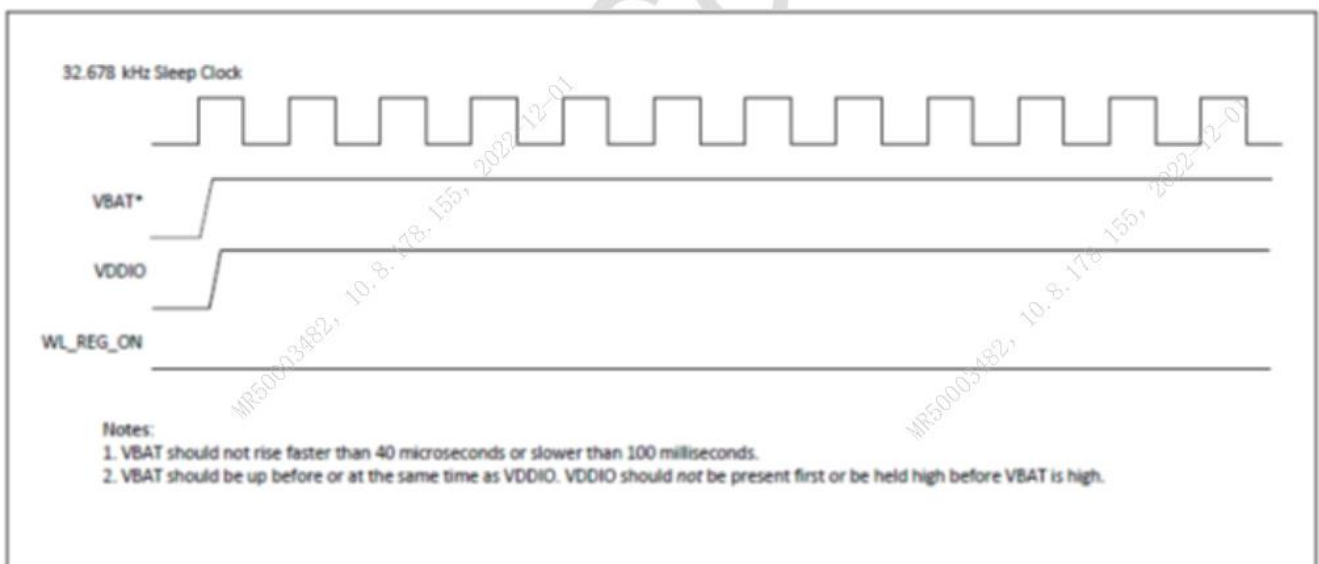
The module has signals that allow the host to control power consumption by enabling or disabling WLAN and internal regulator blocks. These signals are described below.

Additionally, diagrams are provided to indicate proper sequencing of the signals for various operating states. The timing value indicated are minimum required values: longer delays are also acceptable.

- **WL_REG_ON**: Used by the PMU to power up or power down the internal regulators used by the WLAN section. When this pin is high, the regulators are enabled and the WLAN section is out of reset. When this pin is low the WLAN section is in reset.



WLAN=ON



WLAN=OFF

7.2 SDIO Interface Description

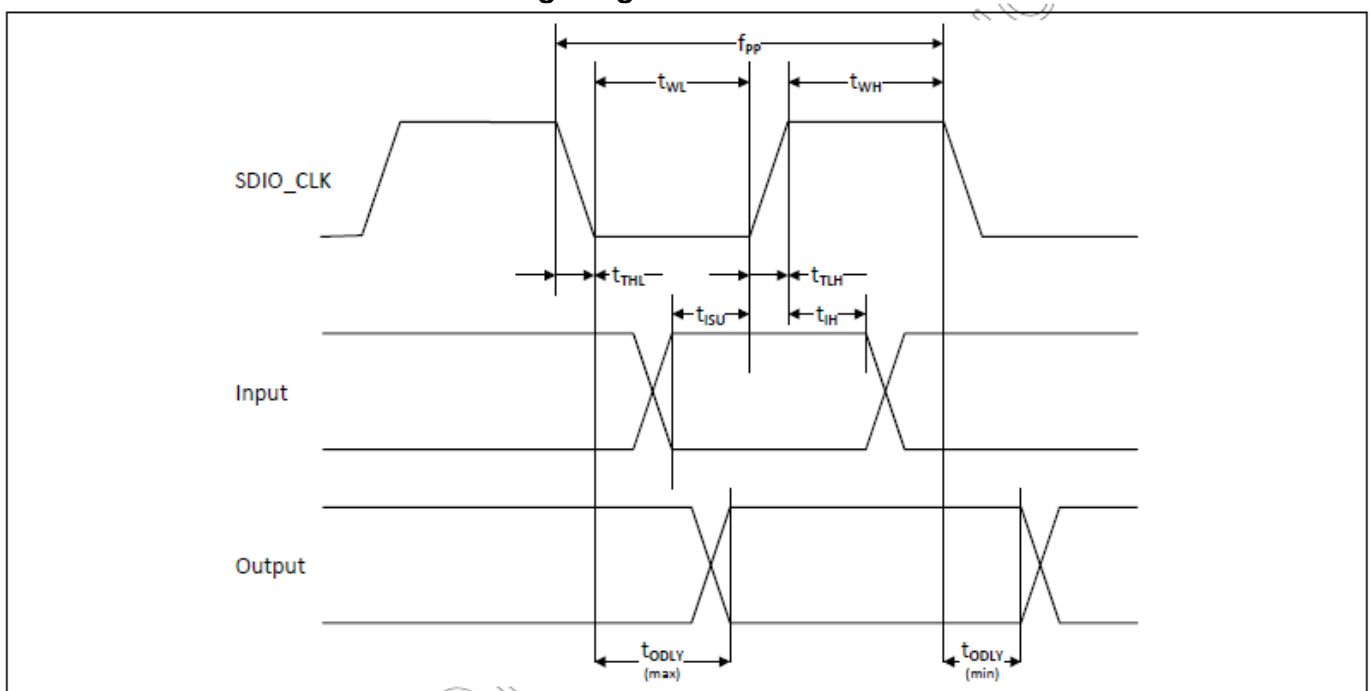
The module supports SDIO version 3.0 for all 1.8V 4-bit UHSI speeds: SDR50(100 Mbps), SDR104(208MHz) and DDR50(50MHz, dual rates) in addition to the 3.3V default speed(25MHz) and high speed (50 MHz). It has the ability to stop the SDIO clock and map the interrupt signal into a GPIO pin. This 'out-of-band' 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.

- Function 0 Standard SDIO function (Max BlockSize / ByteCount = 32B)
- Function 1 Backplane Function to access the internal System On Chip (SOC) address space (Max BlockSize / ByteCount = 64B)
- Function 2 WLAN Function for efficient WLAN packet transfer through DMA (Max BlockSize/ByteCount=512B)

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 SDIO Default Mode Timing Diagram

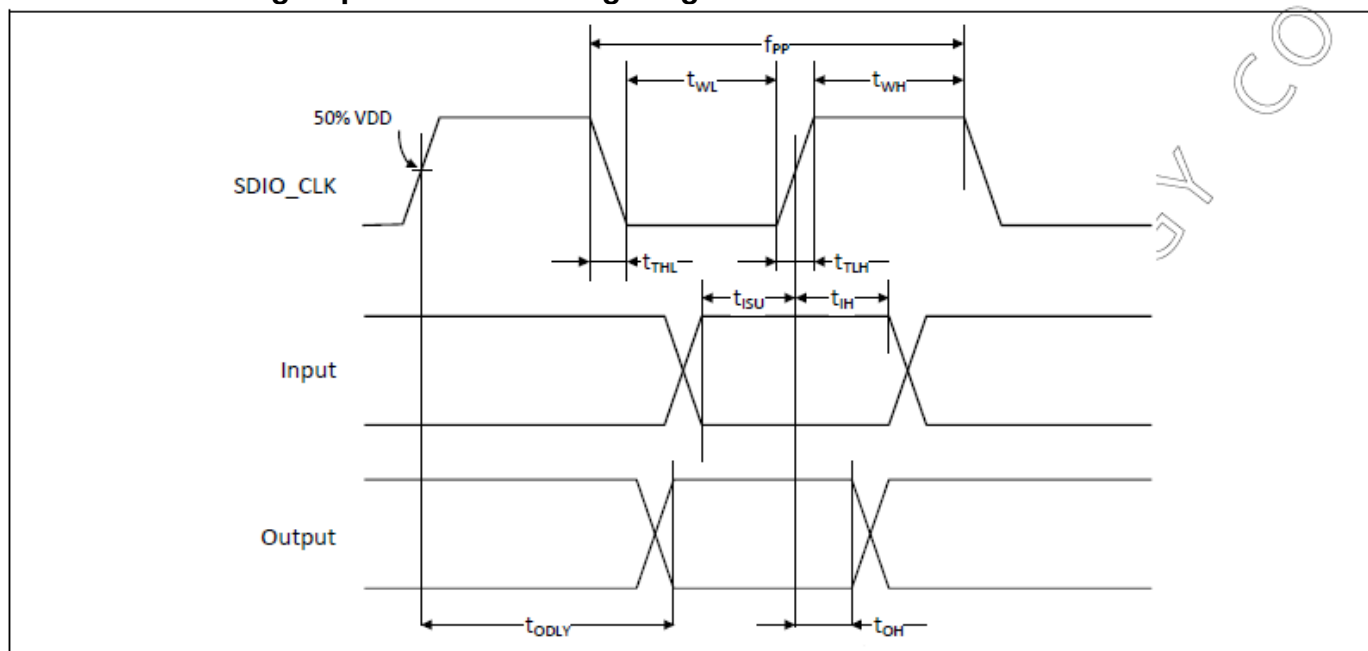


Parameter	Symbol	Minimum	Typical	Maximum	Unit
SDIO CLK (All values are referred to minimum VIH and maximum VIL^b)					
Frequency – Data Transfer mode	fPP	0	–	25	MHz
Frequency – Identification mode	fOD	0	–	400	kHz
Clock low time	tWL	10	–	–	ns
Clock high time	tWH	10	–	–	ns
Clock rise time	tTLH	–	–	10	ns
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 $CL \leq 40\text{pF}$ load on CMD and Data.

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

7.4 SDIO High Speed Mode Timing Diagram



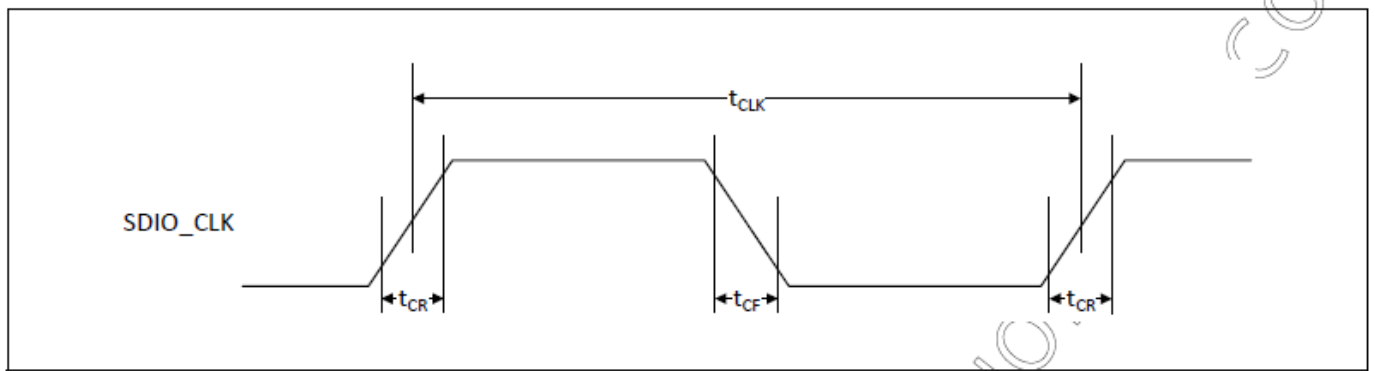
Parameter	Symbol	Minimum	Typical	Maximum	Unit
SDIO CLK (all values are referred to minimum V_{IH} and maximum V_{IL}^b)					
Frequency – Data Transfer Mode	f_{PP}	0	–	50	MHz
Frequency – Identification Mode	f_{OD}	0	–	400	kHz
Clock low time	t_{WL}	7	–	–	ns
Clock high time	t_{WH}	7	–	–	ns
Clock rise time	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 hold time	t_{OH}	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. $\min(V_{IH}) = 0.7 \times V_{DDIO}$ and $\max(V_{IL}) = 0.2 \times V_{DDIO}$.

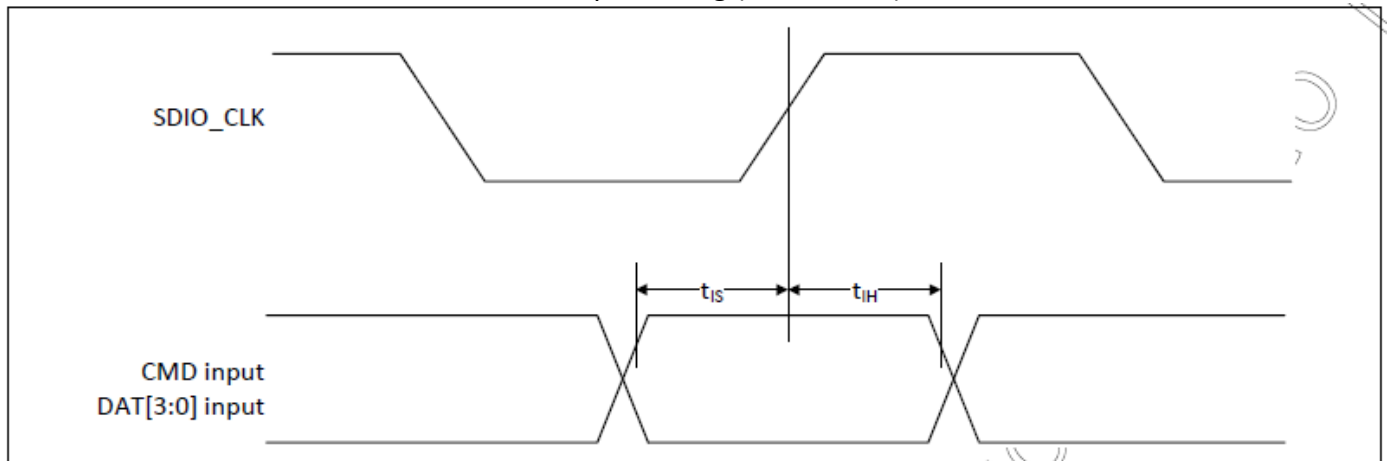
7.5 SDIO Bus Timing Specifications in SDR Modes

Clock timing(SDR Modes)



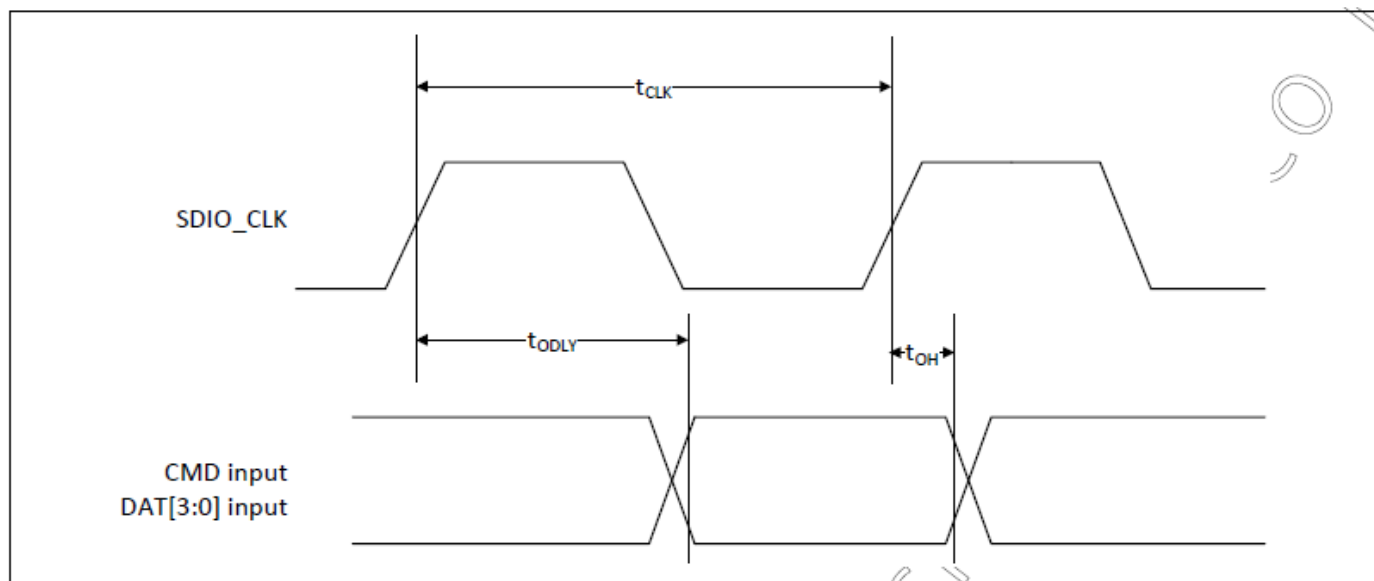
Parameter	Symbol	Minimum	Maximum	Unit	Comments
–	t_{CLK}	40	–	ns	SDR12 mode
		20	–	ns	SDR25 mode
		10	–	ns	SDR50 mode
		4.8	–	ns	SDR104 mode
–	t_{CR}, t_{CF}	–	$0.2 \times t_{CLK}$	ns	$t_{CR}, t_{CF} < 2.00$ ns (max) @100 MHz, $C_{CARD} = 10$ pF $t_{CR}, t_{CF} < 0.96$ ns (max) @208 MHz, $C_{CARD} =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

SDIO Bus Input timing (SDR Modes)



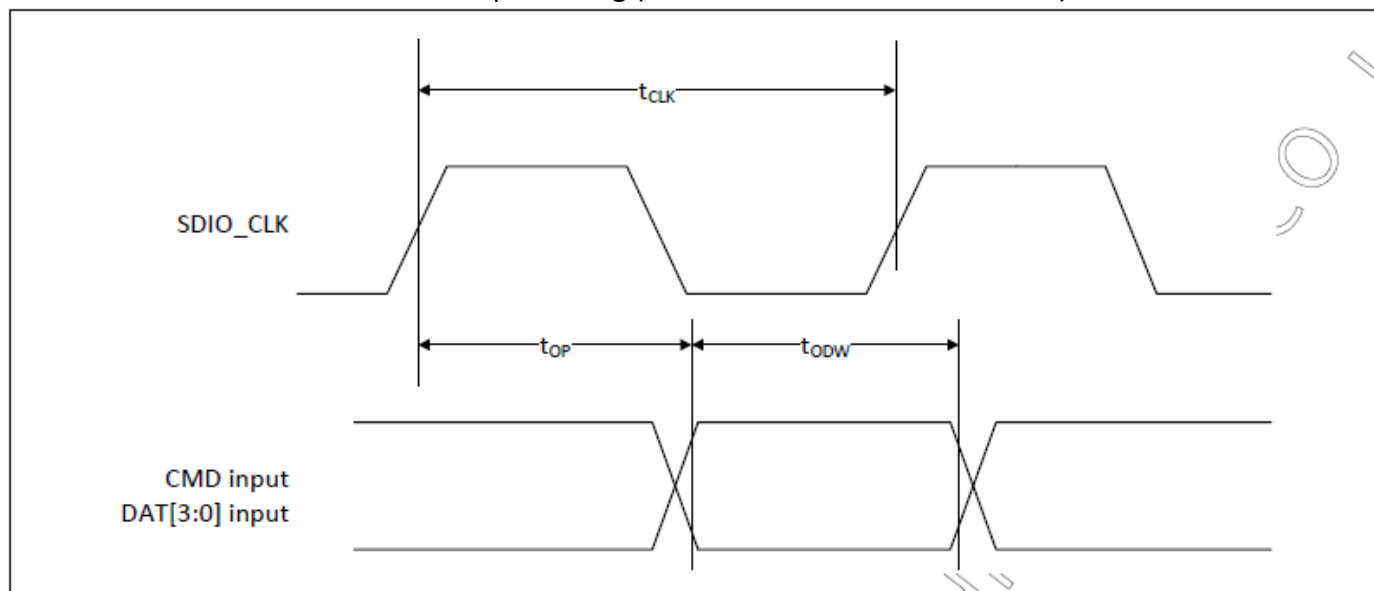
Symbol	Minimum	Maximum	Unit	Comments
SDR104 Mode				
t_{IS}	1.4	–	ns	$C_{CARD} = 10$ pF, VCT = 0.975V
t_{IH}	0.80	–	ns	$C_{CARD} = 5$ pF, VCT = 0.975V
SDR50 Mode				
t_{IS}	3.00	–	ns	$C_{CARD} = 10$ pF, VCT = 0.975V
t_{IH}	0.80	–	ns	$C_{CARD} = 5$ pF, VCT = 0.975V

SDIO Bus output timing (SDR Modes up to 100MHz)



Symbol	Minimum	Maximum	Unit	Comments
t_{ODLY}	–	7.5	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

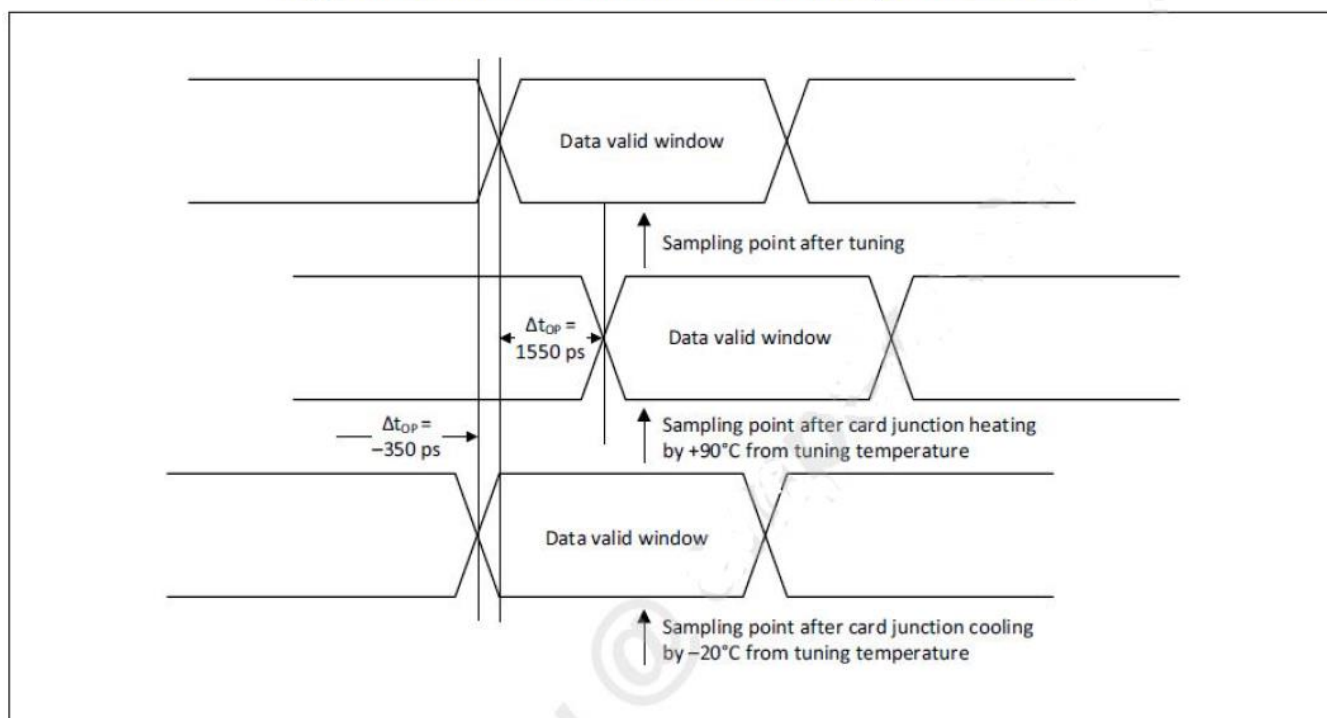
Card output timing (SDR Modes 100MHz to 208MHz)



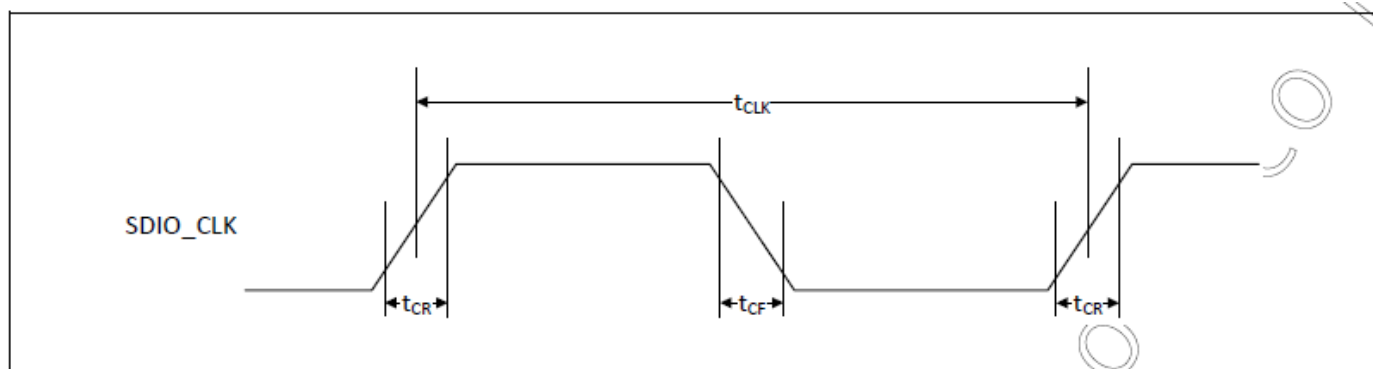
Symbol	Minimum	Maximum	Unit	Comments
t_{OP}	0	2	UI	Card output phase
Δt_{OP}	-350	+1550	ps	Delay variation due to temp change after tuning
t_{ODW}	0.60	–	UI	$t_{ODW}=2.88$ ns @ 208 MHz

- $\Delta t_{OP} = +1550$ 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

Δt_{OP} Consideration for Variable Data Window (SDR 104 Mode)

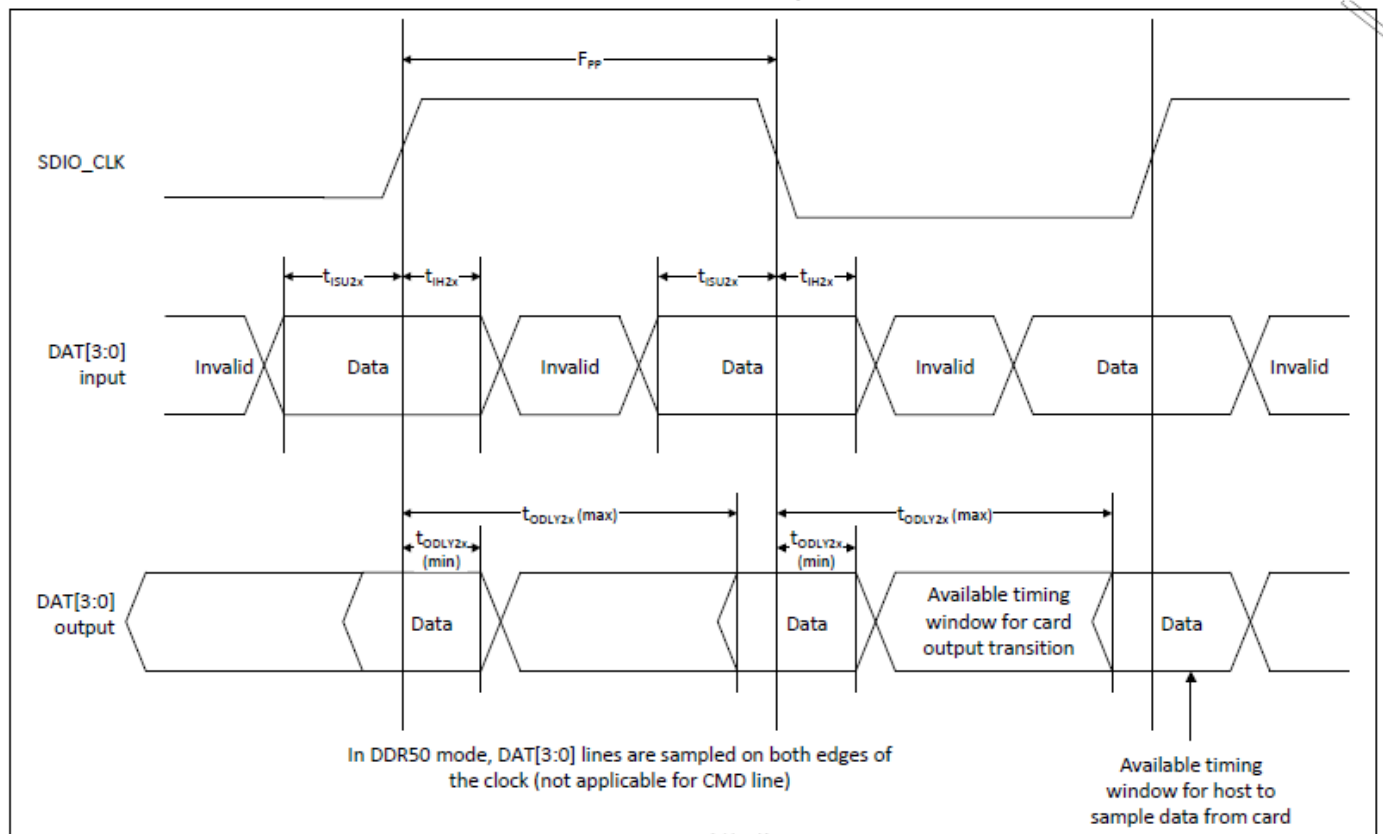


7.6 SDIO Bus Timing Specifications in DDR50 Mode



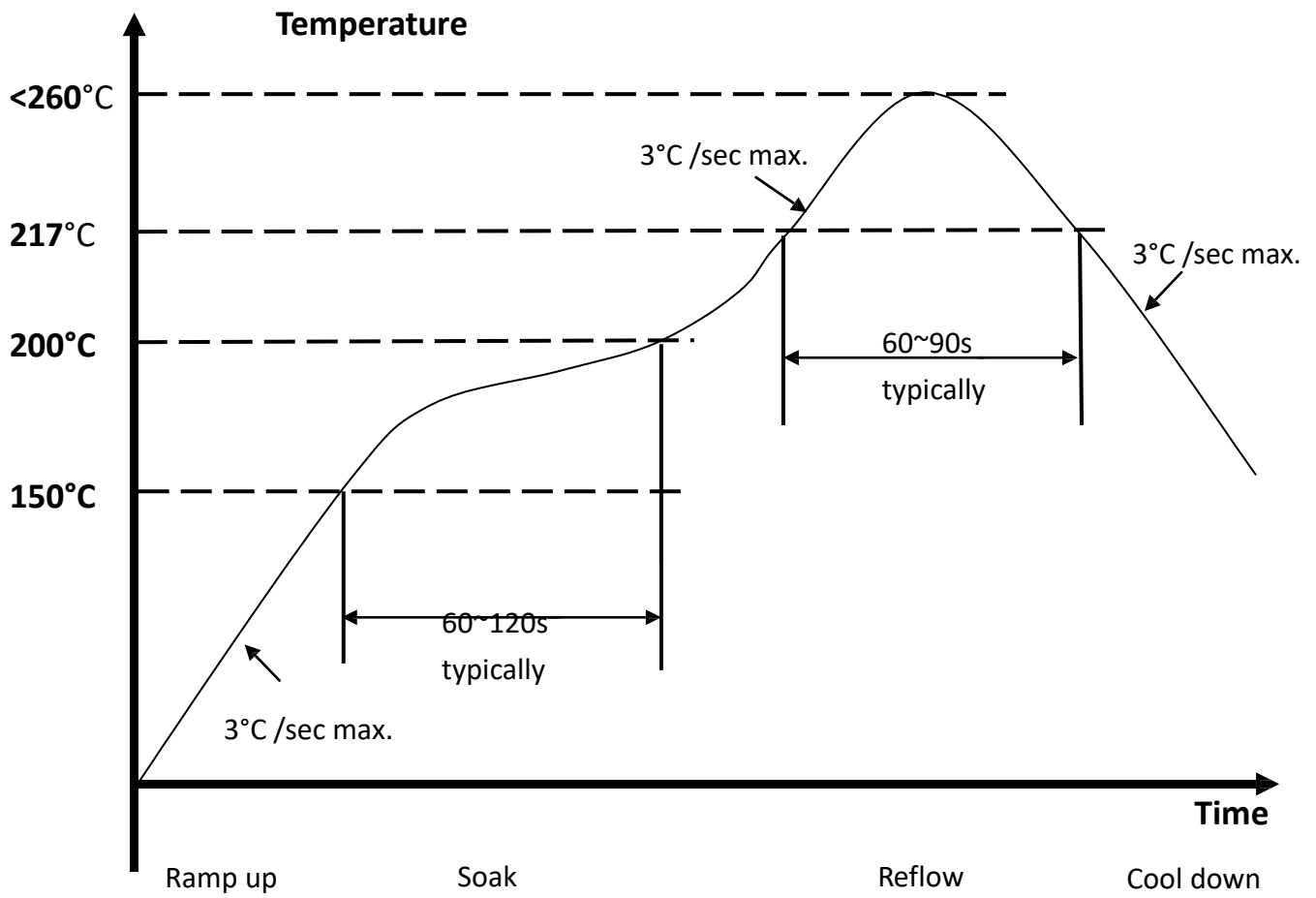
Parameter	Symbol	Minimum	Maximum	Unit	Comments
–	t_{CLK}	20	–	ns	DDR50 mode
–	t_{CR}, t_{CF}	–	$0.2 \times t_{CLK}$	ns	$t_{CR}, t_{CF} < 4.00$ ns (max) @50 MHz, $C_{CARD} = 10$ pF
Clock duty	–	45	55	%	–

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 DAT					
Output delay time	t_{ODLY2x}	–	7.5	ns	$C_{CARD} < 25$ pF (1 Card)
Output hold time	t_{ODLY2x}	1.5	–	ns	$C_{CARD} < 15$ pF (1 Card)

8. Recommended Reflow Profile



1. Referred to IPC/JEDEC standard
2. Peak Temperature : <260°C
3. Cycle of Reflow : 2 times max.
4. Adding Nitrogen (N₂) to implement 2000ppm or less of oxygen concentration during reflow process is recommended.
5. If the shelf time is exceeded, be sure baking step to remove the moisture from the component

Note:

The module is limited to OEM installation only.

This product is mounted inside of the end product only by professional installers OEM. They use this module with changing the power and control signal setting by software of end product within the scope of this application. End user cannot change this setting.

This device is intended only for OEM integrators under the following conditions:

- 1) The antenna must be installed such 20cm is maintained between the antenna and users, the antennas are two FPC antenna(non-detachable).
- 2) The transmitter module may not be co-located with any other transmitter or antenna.

As long as these two conditions are met, further transmitter test will not be required. However, integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed.

The OEM integrator has to be aware no to provide information to the end user regarding how to install or remove this RF module in the user manual of the end product with integrates this module. The end user manual shall include all required regulatory information/warning as show in this manual.

If the FCC identification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module.

This exterior label can use wording such as the following:

“Contains Transmitter Module FCC ID: ZLZ-ALXC29”

When the module is installed inside another device, the user manual of this device must contain below warning statement:

Federal Communication Commission Interference Statement

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.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generate, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment.

This equipment should be installed and operated with minimum distance 20cm between the radiator and your body.

Caution:

Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

That separate approval is required for all other operating configurations, including portable configurations with respect to Part 2.1093 and different antenna configurations.