欧飞信科技

O2066PB

Wi-Fi Tri-band 2x2 MIMO DBS
802.11ax + Bluetooth5.2
Module Datasheet

Cover of Approval Sheet

PRODUCT NAME	Part No.	Description
O2066PB	FWAAO2066PB10	QCA2066 PCIE 3.3V 2T2R 15*13*2.3mm DBS 11ax BT5.2-Uart External 2antenna Shield CAN

Customer: _____

Customer P/N: _____

Signature: _____

Date: _____

Maker Information:

OFEIXIN TECHNOLOGY LIMITED

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Shangcun Community, Gongming Street, Guangming District, Shenzhen

Revision History

Version	Date	Description	Draft	Approved
V0.1	2022-08-18	-Preliminary Project version	CCJ	Turbo
V1.0	2022-11-28	-Addition the description	CCJ	Turbo

CONTENTS

1.Overview

1.1 Introduction

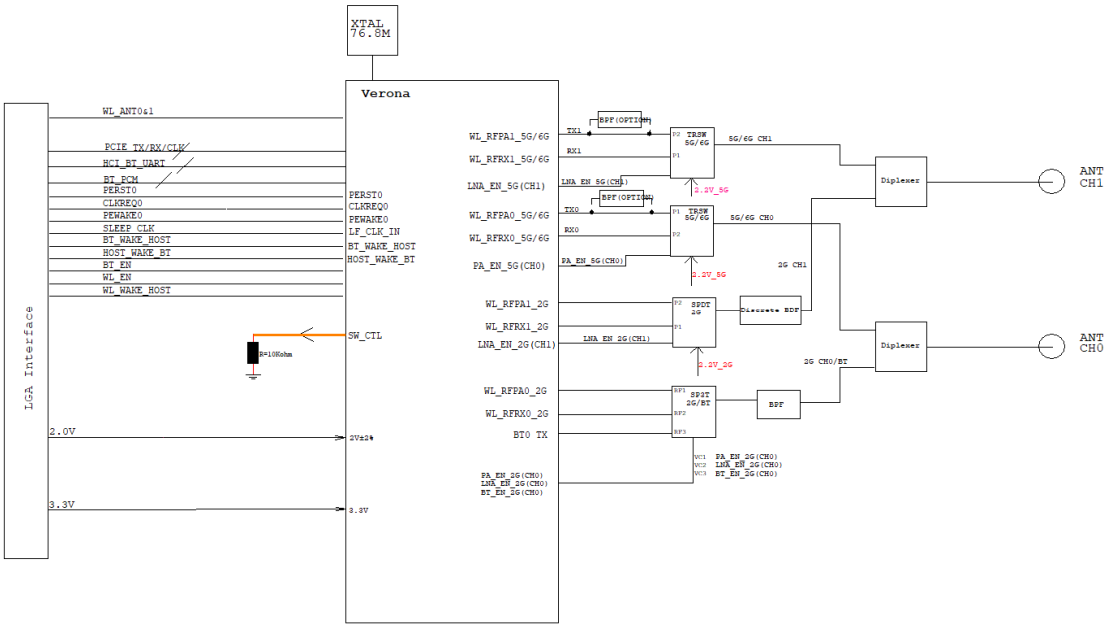
The O2066PB device is a highly integrated module supporting 802.11ax Wi-Fi and Bluetooth5.2. The O2066PB device supporting simultaneous operation on 2.4 GHz and 5 GHz, or 6 GHz, also known as Dual Band Simultaneous (DBS).

The wireless module complies with IEEE 802.11 a/b/g/n/ac/ax 2x2 MIMO standard and it can achieve up to a speed of 2975.6Mbps (5/6G 2x2 160MHz 11ax +2.4G 2x2 40MHz 11ax DBS). The integrated module provides PCIe interface for Wi-Fi, UART/PCM interface for Bluetooth.

1.2 Features

- Supports 2x2 Multi-User Multiple-Input Multiple-Output (MU-MIMO).
- Dual Band Simultaneous (DBS), up to 3 Gbps data rate (5/6G 2x2 160MHz 11ax +2.4G 2x2 40MHz 11ax DB).
- Tri-band 2.4 GHz/5 GHz/6 GHz support.
- 20MHz/40MHz channel bandwidth for 2.4 GHz and 20MHz/40MHz/80MHz/160 MHz channel bandwidth for 5 GHz/6 GHz.
- Seamless antenna sharing with Bluetooth, LTE, LTE-U, and 5G.
- Dynamic Frequency Selection (DFS, radar detection) .
- Offloading traffic for minimal host utilization at 802.11ac/ ax speeds.
- Low-power PCIe (with L1 substate) interface.
- Integrated close-loop power detector.
- Supports 2 Mbps Bluetooth Low Energy (BLE), BLE Long Range.
- Split ACL support for A2DP true stereo (earbuds) .
- Dual eSCO and dual A2DP streams.
- Backward-compatible with previous Bluetooth standards.
- Small SMT LGA package for placement.

1.3 Block Diagram



1.4 General Specification

Model Name	O2066PB
Product Description	Support WiFi6E+BT5.2
Dimension	L x W x H: 15 x 13 x 2.3 (typical) mm
Wi-Fi Interface	Support PCIe
BT Interface	UART/PCM
Operting temperature	-30°C to 70°C
Storage temperature	-40°C to 125°C

1.5 Recommended Operating Rating

Feature		Minimum	Type	Maximum	Units
Operating Temperature		-30	25	70	°C
VBAT		3.25	3.8	4.3	V
VDD		1.95	2.0	2.05	V
Power Consumption (Type VCC)		VBAT		VDD	
	TX (2.4G HE40)	92 mA		535 mA	
	RX (2.4G HE40)	78 mA		115 mA	
	TX (5G HE160)	118 mA		515 mA	
	RX (5G HE160)	92 mA		175 mA	
	Power Up	71mA		95mA	
	BT TX（2M@4dBm）	20mA		68mA	
	BT RX	27mA		40mA	

Note: Use QRCT tool, TX mode:EnablingContinuousModulatedTX;Duty Cycle:50%;TX Power Control:AutoPower, test the maximum current of the module 3.3V and 2V power supply when NSS=1.

2. RF Specification

2.1 Wi-Fi RF Specification

2.4GHz RF Specification	
Feature	Description
Operating Frequency	2.400～2.4835GHz
Standards	Wi-Fi: IEEE 802.11b/g/n/ac/ax & Wi-Fi compliant
Operating Channel	2.4GHz : Ch1~14
Modulation	802.11b : CCK 802.11 g/n/ac/ax : OFDM /1024-QAM、256-QAM、64-QAM、16-QAM、QPSK、BPSK
PHY Data rates	Wi-Fi:802.11b:11,5.5,2,1Mbps 802.11g:54,48,36,24,18,12,9,6Mbps 802.11n: up to 300Mbps 802.11ac: up to 400Mbps 802.11ax:up to 3 Gbps data rate (2.4G 2x2+5G or 6G 2x2 11ax DBS)

Output Power, tolerance ± 1.5 dB			
Protocol Standard	Data Rate	Spec.(dBm)	EVM(dBm)
802.11b	@11Mbps	17	≦-9
802.11g	@54Mbps	14	≦-25
802.11n	@HT40 MCS 7	13	≦-28
802.11ac	@vHT40 MCS 9	12	≦-32
802.11ax	@HE40 MCS 11	11	≦-35
Receiver Sensitivity, CCK modulation PER≦8%、OFDM modulation PER≦10%			
Protocol Standard	Data Rate	Spec.(dBm)	
802.11b(20MHz)	1Mbps	-82	
	11Mbps	-76	
802.11g(20MHz)	6Mbps	-82	
	54Mbps	-64	
802.11n(20MHz)	MCS 0 NSS1	-82	
	MCS 7 NSS1	-64	
802.11n(40MHz)	MCS 0 NSS1	-79	
	MCS 7 NSS1	-61	
802.11ac(20MHz)	MCS 0 NSS1	-82	
	MCS 9 NSS1	-59	
802.11ac(40MHz)	MCS 0 NSS1	-79	
	MCS 9 NSS1	-57	
802.11ax(20MHz)	MCS 0 NSS1	-82	
	MCS 11 NSS1	-52	
802.11ax(40MHz)	MCS 0 NSS1	-79	
	MCS 11 NSS1	-49	
5GHz RF Specification			
Feature	Description		
Operating Frequency	5G:5.15 GHz ~ 5.845 GHz (5.0 GHz ISM Band)		
Standards	Wi-Fi: IEEE 802.11 a/n/ac/ax 2x2, Wi-Fi compliant		
Modulation	802.11 a/n/ac/ax : OFDM /1024-QAM、256-QAM、64-QAM、16-QAM、QPSK、BPSK		
PHY Data rates	Wi-Fi: 802.11a:54,48,36,24,18,12,9,6Mbps 802.11n: up to 300Mbps 802.11ac: up to 800Mbps（5G 2x2 VHT80） 802.11ax:up to 3 Gbps data rate (2.4G 2x2+5G 2x2 11ax DBS)		
Output Power, tolerance ± 1.5 dB			
Protocol Standard	Data Rate	Spec.(dBm)	EVM(dBm)
802.11a	@54Mbps	14	≦-25
802.11n	@HT40 MCS 7	13	≦-28
802.11ac	@vHT80 MCS 9	12	≦-32
802.11ax	@HE160 MCS 11	10	≦-35

Receiver Sensitivity,OFDM modulation PER≦10%			
Protocol Standard	Data Rate	Spec.(dBm)	
802.11a(20MHz)	6Mbps	-82	
	54Mbps	-64	
802.11n(20MHz)	MCS 0 NSS1	-82	
	MCS 7 NSS1	-64	
802.11n(40MHz)	MCS 0 NSS1	-79	
	MCS 7 NSS1	-64	
802.11ac(20MHz)	MCS 0 NSS1	-82	
	MCS 9 NSS1	-57	
802.11ac(40MHz)	MCS 0 NSS1	-79	
	MCS 9 NSS1	-54	
802.11ac(80MHz)	MCS 0 NSS1	-76	
	MCS 9 NSS1	-51	
802.11ax(20MHz)	MCS 0 NSS1	-82	
	MCS 11 NSS1	-52	
802.11ax(40MHz)	MCS 0 NSS1	-79	
	MCS 11 NSS1	-49	
802.11ax(80MHz)	MCS 0 NSS1	-76	
	MCS 11 NSS1	-46	
802.11ax(160MHz)	MCS 0 NSS1	-73	
	MCS 11 NSS1	-43	
6GHz RF Specification			
Feature	Description		
Operating Frequency	6G: 5.925 GHz ~ 7.125 GHz		
Standards	Wi-Fi: IEEE 802.11 a/n/ac/ax 2x2, Wi-Fi compliant		
Modulation	802.11 a/n/ac/ax : OFDM /1024-QAM、256-QAM、64-QAM、16-QAM、QPSK、BPSK		
PHY Data rates	Wi-Fi: OFDM:54,48,36,24,18,12,9,6Mbps 802.11ax:up to 3 Gbps data rate (2.4G 2x2+6G 2x2 11ax DBS)		
Output Power, tolerance ± 1.5 dB			
Protocol Standard	Data Rate	Spec.(dBm)	EVM(dBm)
802.11a	@54Mbps	12	≦-25
802.11n	@HT40 MCS 7	12	≦-28
802.11ac	@VHT80 MCS 9	10	≦-32
802.11ax	@HE160 MCS 11	8.5	≦-35
Receiver Sensitivity,OFDM modulation PER≦10%			
Protocol Standard	Data Rate	Spec.(dBm)	
802.11a(20MHz)	6Mbps	-82	
	54Mbps	-64	
802.11ax(20MHz)	MCS 0 NSS1	-82	

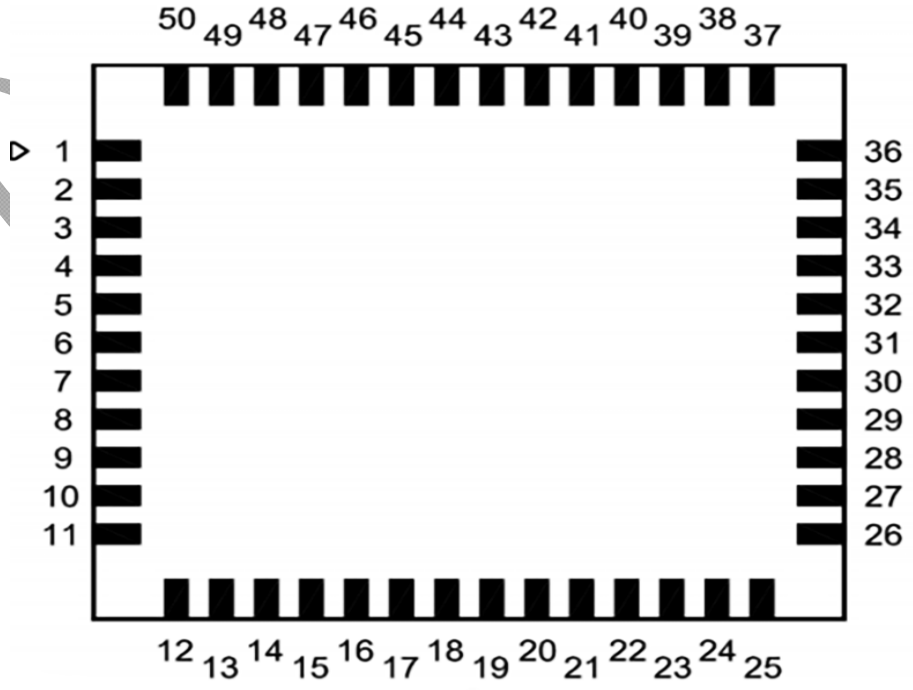
	MCS 11 NSS1	-52
802.11ax(40MHz)	MCS 0 NSS1	-79
	MCS 11 NSS1	-49
802.11ax(80MHz)	MCS 0 NSS1	-76
	MCS 11 NSS1	-46
802.11ax(160MHz)	MCS 0 NSS1	-73
	MCS 11 NSS1	-43

2.2 BT RF Specification

Feature	Description		
Operating Frequency	2.402～2.480GHz		
Number of Channels	79 channels		
Standards	Bluetooth V5.2		
Modulation	8DPSK, π/4 DQPSK, GFSK		
PHY Data rates	Supports 2Mbps Bluetooth Low Energy(BLE),BLELong Range		
Output Power	Min(dBm)	Typical(dBm)	Max(dBm)
		4	
Sensitivity @ BER=0.1% for GFSK (1Mbps)		-92	
Sensitivity @ BER=0.01% for π/4-DQPSK (2Mbps)		-92	
Sensitivity @ BER=0.01% for 8DPSK (3Mbps)		-	

3.Pin Assignments

3.1 Pin Outline



3.2 Pin Definition

Top side

NO	Name	Type	Description	Voltage
1	GND	-	Ground connections	
2	WL_ANT0	I/O	RF WIFI&BT 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	PCIE_PREST_L	I	PCIe host indication to reset the device	1.8V
13	NC	-	NC	
14	NC	-	NC	
15	WL_REG_ON	I	WIFI enable signal from Host	1.8V
16	WL_HOST_WAKE	O	WLAN to wake-up HOST	1.8V
17	LTE-TX	O	LTE co-existence signal.NC if not used	1.8V
18	LTE-RX	I	LTE co-existence signal.NC if not used	1.8V
19	PCM_OUT	O	PCM Data output	1.8V
20	PCM_IN	I	PCM data input	1.8V
21	PCM_SYNC	I/O	PCM sync signal	1.8V
22	PCM_CLK	I/O	PCM clock	1.8V
23	GND	-	Ground connections	
24	PEWAKE0#(I/O)	I/O	PCIe wake up host,open drain,active low	1.8V
25	NC	-	NC	
26	NC	-	NC	
27	NC	-	NC	
28	NC	-	NC	
29	NC	-	NC	
30	GND	-	Ground connections	

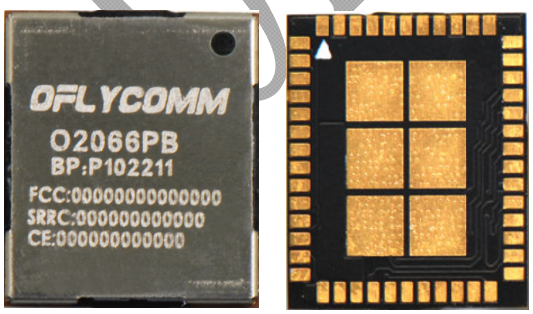
31	NC	-	NC	
32	GND	-	Ground connections	
33	PCIE_RCLK_N	I	PCIe clock differential input signal	
34	VDD	P	Main power voltage source input	2 .0V
35	PCIE_RCLK_P	I	PCIe clock differential input signal	
36	VBAT	P	Main power voltage source input	3.8V
37	PCIE_CLKREQn	I/O	PCIe clock request	1.8V
38	BT_REG_ON	I	BT enable signal from Host	1.8V
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	PCIE_RX_N	I	PCIe RX differential signals	
45	PCIE_RX_P	I	PCIe RX differential signals	
46	PCIE_TX_N	O	PCIe TX differential signals	
47	PCIE_TX_P	O	PCIe TX differential signals	
48	NC	-	NC	
49	BT_WAKE	I	HOST wake-up Bluetooth device	1.8V
50	BT_HOST_WAKE	O	Bluetooth device to wake-up HOST	1.8V

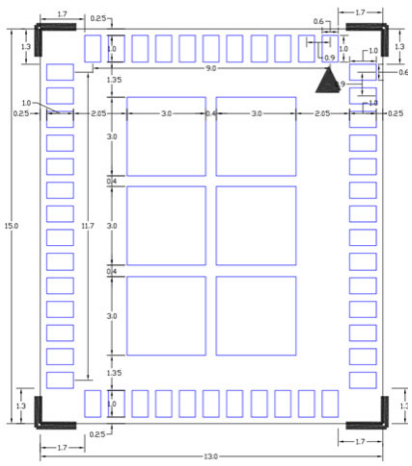
4.Dimensions

4.1 Physical Dimensions and Module Photo

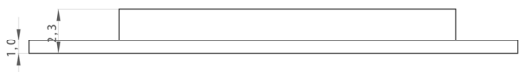
(Unit: mm)

L x W：15 x 13(+0.3/-0.1) mm





H: 2.3 (±0.2)mm

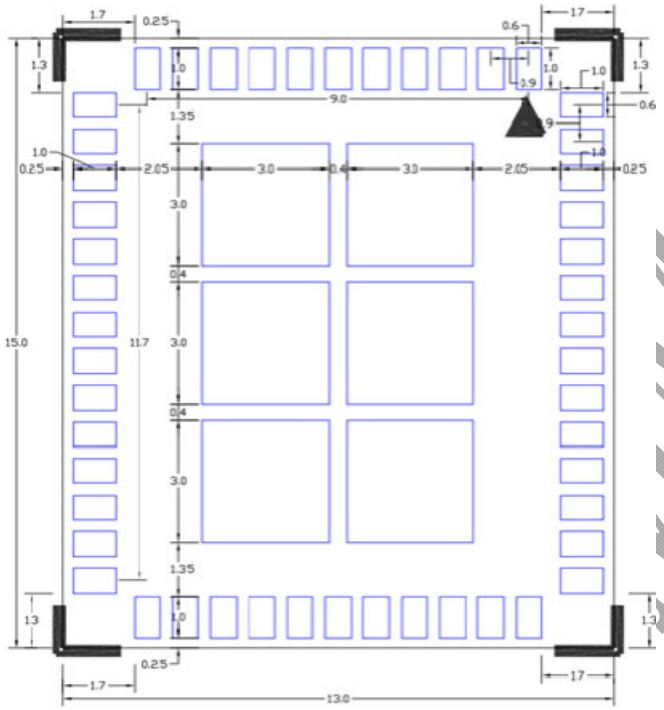


Weight	4.5g

4.2 Module Physical Dimensions

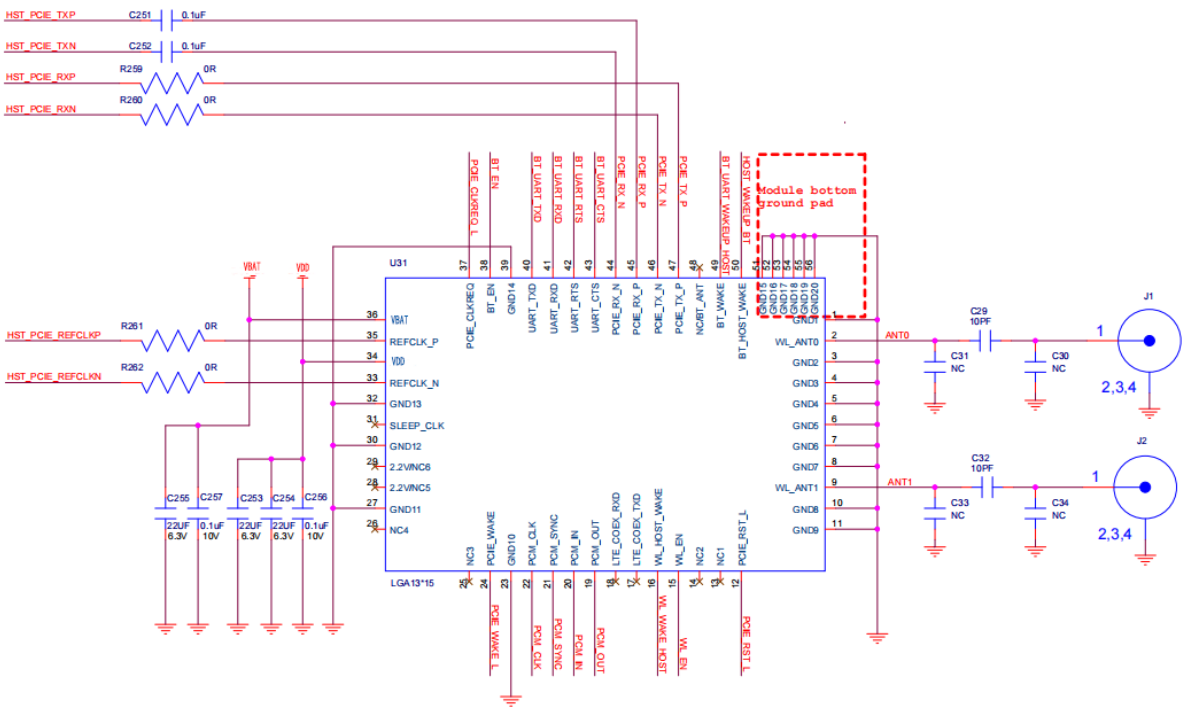
(Unit: mm)

< TOP VIEW >



5 Reference Design

5.1 Reference schematic



Note:

a） C255, C257 need to be close to VBAT. C253, C254, C256 need to be close to VDD

b） The power supply “VDD、VBAT” switching noise is less than 100mV and the ripple is less than 30 mV.

c） PCIe differential signals should be followed 100 Ohm impedance.

d） VBAT power supply current needs to be more than 1A, VDD power supply current needs to be more than 2A.

e） PCB design must maintain a large enough heat dissipation area, and place as many vias as possible at the grounding position of the module center pad to ensure heat dissipation.

5.2 External Antenna

When the customer selects an external antenna, the external antenna selected must meet the parameter requirements specified ,Impedance 50Ω

5.3 Real-world Testing

2.4G Real-world Testing					
Protocol Standard		channel	Power (dBm)	EVM(dB)	Rx Sensitivity (dBm)
802.11g(54Mps)	ANT0	2412	14.2	-36.3	-71
		2437	14.1	-36.9	-71
		2472	13.7	-36.1	-71
	ANT1	2412	14.4	-37.7	-71
		2437	14.4	-37.5	-71
		2472	14.9	-36.6	-71
802.11ax(HE20_MCS11)	ANT0	2412	12.4	-38.9	-56
		2437	12.1	-40.1	-56
		2472	11.4	-39.7	-56
	ANT1	2412	11.9	-39.7	-56
		2437	11.5	-41	-56
		2472	11.9	-39.7	-56
802.11ax(HE40_MCS11)	ANT0	2422	10.8	-35.5	-54
		2462	10.3	-35	-54
	ANT1	2422	10.8	-35.3	-54
		2462	11.1	-35.6	-54
5G Real-world Testing					
Protocol Standard		channel	Power (dBm)	EVM(dB)	Rx Sensitivity (dBm)
802.11a(54Mps)	ANT0	5180	14.4	-37.2	-71
		5500	14.1	-32	-71
		5825	14	-34.2	-71
	ANT1	5180	14.5	-37.2	-71
		5500	14.3	-31	-71
		5825	14.1	-36.3	-71
802.11ax(HE20_MCS11)	ANT0	5180	12.4	-41.7	-58
		5500	12.2	-38.5	-58

		5825	12.3	-37.8	-58
	ANT1	5180	12.7	-40.4	-57
		5500	12.2	-40	-58
		5825	11.9	-39.2	-57
802.11ax(HE80_MCS11)	ANT0	5210	10.7	-40	-52
		5690	10.3	-38.3	-52
		5775	10..4	-39.2	-52
	ANT1	5210	11.1	-39.8	-51
		5690	10.8	-39.4	-52
		5775	10.7	-39.3	-52
802.11ax(HE160_MCS11)	ANT0	5250	10.9	-36.5	-48
		5570	10.3	-35.7	-49
	ANT1	5250	11.2	-36.5	-48
		5570	10.6	-37.1	-49
6G Real-world Testing					
Protocol Standard		channel	Power (dBm)	EVM(dB)	Rx Sensitivity (dBm)
802.11a(54Mps)	ANT0	6015	12.3	-38.5	-71
		6515	12.6	-32	-71
		7115	11.9	-31	-71
	ANT1	6015	10.9	-32	-71
		6515	12.2	-36	-71
		7115	12.6	-33	-71
802.11ax(HE20_MCS11)	ANT0	6015	10.7	-41	-58
		6515	10	-40.5	-57
		7115	10	-37	-57
	ANT1	6015	10.5	-40	-57
		6515	10.3	-39	-57
		7115	10	-37.5	-57
802.11ax(HE80_MCS11)	ANT0	5985	9.3	-40.5	-52
		6545	8.7	-39.5	-52
		7025	9.3	-37	-52
	ANT1	5985	8.8	-40	-51
		6545	9.2	-37.5	-52
		7025	9.6	-38	-52
802.11ax(HE160_MCS11)	ANT0	6025	8.9	-38.5	-49
		6505	8.5	-36.5	-48
		6985	8.4	-36.5	-49
	ANT1	6025	8.9	-38	-49
		6505	9	-35.5	-48
		6985	9.6	-36	-48

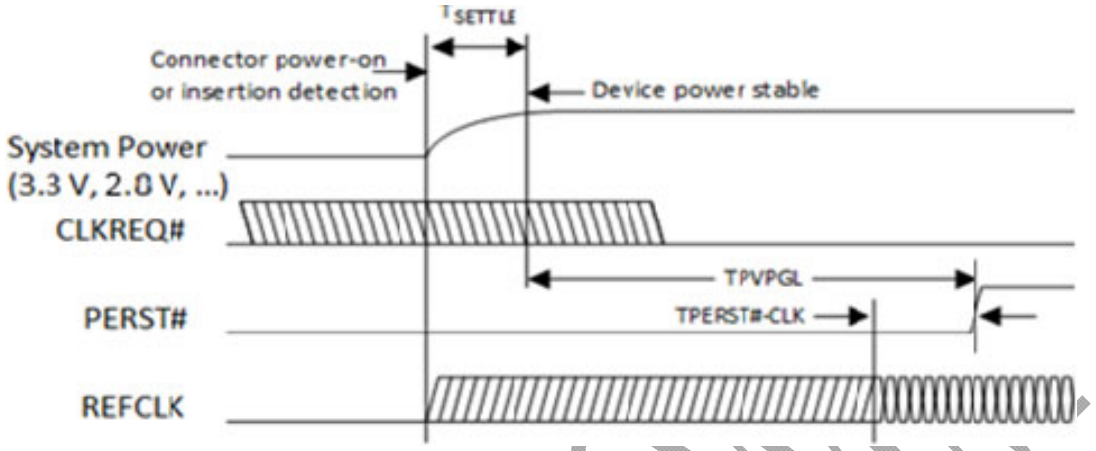
Description: The test environment is: temperature 25 °C humidity 60%

6 Host Interface Timing Diagram

6.1 PCIe powerup sequence timing

Supports PCIe Gen 3 interface for WLAN.

Compliant to PCIe Gen 3 powerup sequence timing.

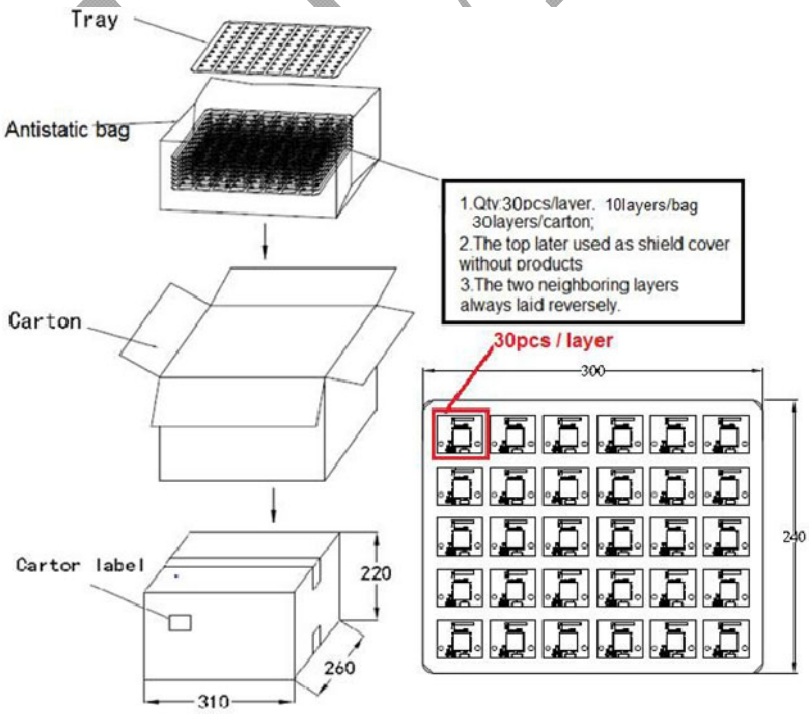


Symbol	Parameter	Min	Max	Units
T_{PVPGL}	Power Valid* to PERST# input inactive	Implementation specific; recommended 50 ms		ms
$T_{PERST\#-CLK}$	REFCLK stable before PERST# inactive	100		µs

Note: *Power Valid when all the voltage supply rails have reached their respective V_{min}.

7 Package

7.1 Reel



7.2 Storage Temperature And Humidity

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.

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.

THE END