

CDW-47W265S

Dual band WiFi6+BT5.4 Module Spec (SDIO3.0+UART, 3 antenna type)

1. Overview

The 47W265S is a highly integrated module, supporting 2T2R 802.11ax and Bluetooth 5.4. The Wi-Fi system integrates PMU, MAC, PHY and Radio. It is designed to be fully compliant with IEEE 802.11ax (aka Wi-Fi 6) standard and can operate at both 2.4GHz and 5GHz band. The max PHY data rate can reach up to 1201Mbps when operating at 80MHz bandwidth. It supports SDIO 3.0 host interface. The integrated Bluetooth controller is compliant with Bluetooth 5.4 supporting BDR/EDR2.1 and Bluetooth Low Energy dual mode featuring the most desired BLE audio. It supports a high-speed UART interface. The Wi-Fi baseband consists of MAC and PHY.

The Bluetooth modem supports BDR, EDR2/EDR3 modulations, and LE 1M, LE 2M, LE 2S and LE 8S BLE rates.

2. Features

Wi-Fi

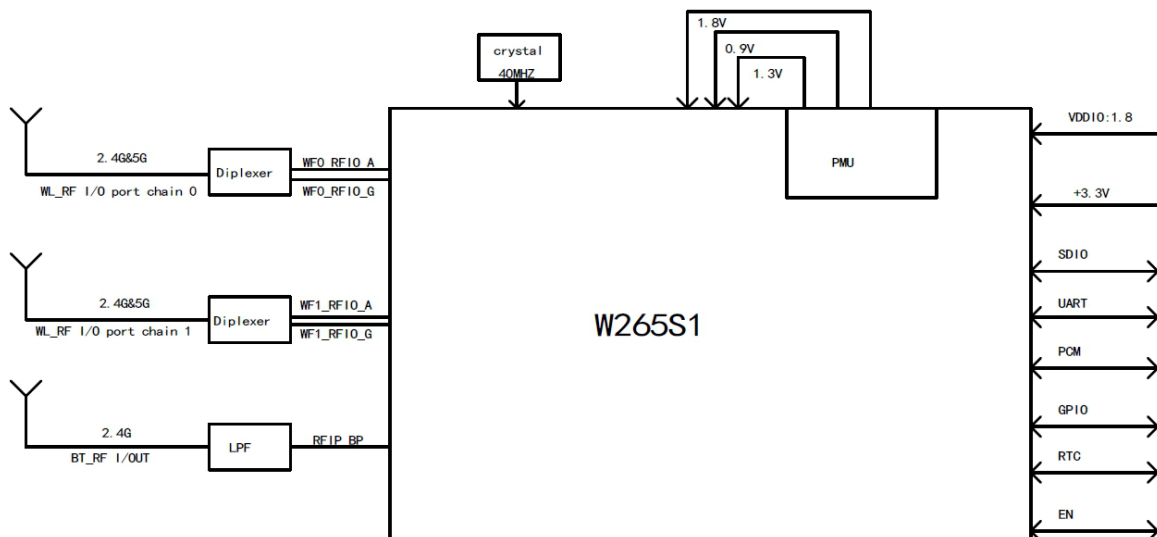
- Compliant with IEEE 802.11 a/b/g/n/ac/ax
- Supports two spatial streams 2T2R MIMO
- Supports 2.4GHz and 5GHz
- Supports 20/40/80MHz bandwidth and modulation up to 1024-QAM
- Supports MU-MIMO RX
- Supports OFDMA RX and TB OFDMA TX
- Supports SU/MU RX Beamformee
- Supports STBC and LDPC
- Supports DFS and Radar detection
- Integrated PA/LNA/TR switch and single-ended RF port for both 2.4GHz and 5GHz
- Supports Wake-on-WLAN with programmable magic packet
- Security features:

Supports WEP-40/WEP-104, AES/TKIP/CCMP/GCMP
Supports WPA/WPA2/WPA3 personal, WPA2/WPA3 enterprise
Supports WPS2.0
Supports WAPI

Bluetooth

- Supports Bluetooth 5.4 with BLE audio
- Supports dual mode BDR/EDR and BLE
- Supports LE 1Mbps, LE 2Mbps, and LE coded for Long Range
- Supports Bluetooth Class 1 or Class 2 TX output power
- Supports dedicated Bluetooth antenna, or shared Bluetooth antenna with WLAN 2.4GHz
- Supports Bluetooth/Wi-Fi coexistence
- Supports LE privacy, DPLE, and LE secure connection
- Supports SCO/eSCO and A2DP
- Supports LE isochronous channels
- Supports HS-UART and PCM interfaces
- Supports AFH for interference avoidance
- Backward-compatible with previous Bluetooth standards

3. Block Diagram



4. General Specification

Model	CDW-47W265S-11(OEM)
Product Name	WiFi 11a/b/g/n/ac/ax 2T2R and BT5.4 Module
Major Chipset	Amlogic W265S1
Standard	IEEE802.11a/b/g/n/ac/ax, Bluetooth V2.1+EDR/BT5.4
Data Transfer Rate	Max:1201 Mbps
Modulation Method	DSSS/DBPSK/DQPSK/16-QAM/ 64-QAM/256QAM/1024QAM
Frequency Band	2.4~2.4835GHz , 5.0~5.8 GHz
Spread Spectrum	IEEE 802.11b: DSSS (Direct Sequence Spread Spectrum) IEEE802.11a/g/n/ac/ax: OFDM (Orthogonal rthogonal Frequency Division Multiplexing)
Operation Mode	Ad hoc, Infrastructure
Security	WEP, TKIP, AES, WPA, WPA2
Interface	Wi-Fi : SDIO , Bluetooth : UART
Operating Temperature	-20~ +70° C ambient temperature
Storage Temperature	-20 ~+85°C ambient temperature
Humidity	5 to 90 % maximum (non-condensing)

5. Electrical Characteristics

5.1 Absolute Maximum Ratings

The table below gives the absolute maximum ratings. Exposure to stresses beyond those listed in this table may result in permanent device damage, unreliability or both

Table 5-1 Absolute Maximum Ratings

Symbol	Parameter	Max.	Unit
AVDD33	Analog supply voltage for 3.3v pin	3.63	V
DVDD	Digital core supply voltage	1	V
VDDIO	I/O supply voltage	1.98	V
VHBM	Max ESD Voltage, HBM	2000	V
VCDM	Max ESD Voltage, CDM	500	V
TSTG	Storage temperature	125	°C

5.2 DC Electrical Characteristics

Table 5-2 DC Electrical Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
VIL	Input Low Voltage	VDDIO=1.8V	-0.3		0.6	V
VIH	Input High Voltage	VDDIO=1.8V	1.2		2.1	V
VoL	Output Low Voltage	VDDIO=1.8V	-0.3		0.4	V
VoH	Output High Voltage	VDDIO=1.8V	1.4		2.1	V
RPU	Input Pull-Up Resistance	VDDIO=1.8V	10	50	100	kΩ
RPd	Input Pull-Down Resistance	VDDIO=1.8V	10	50	100	kΩ

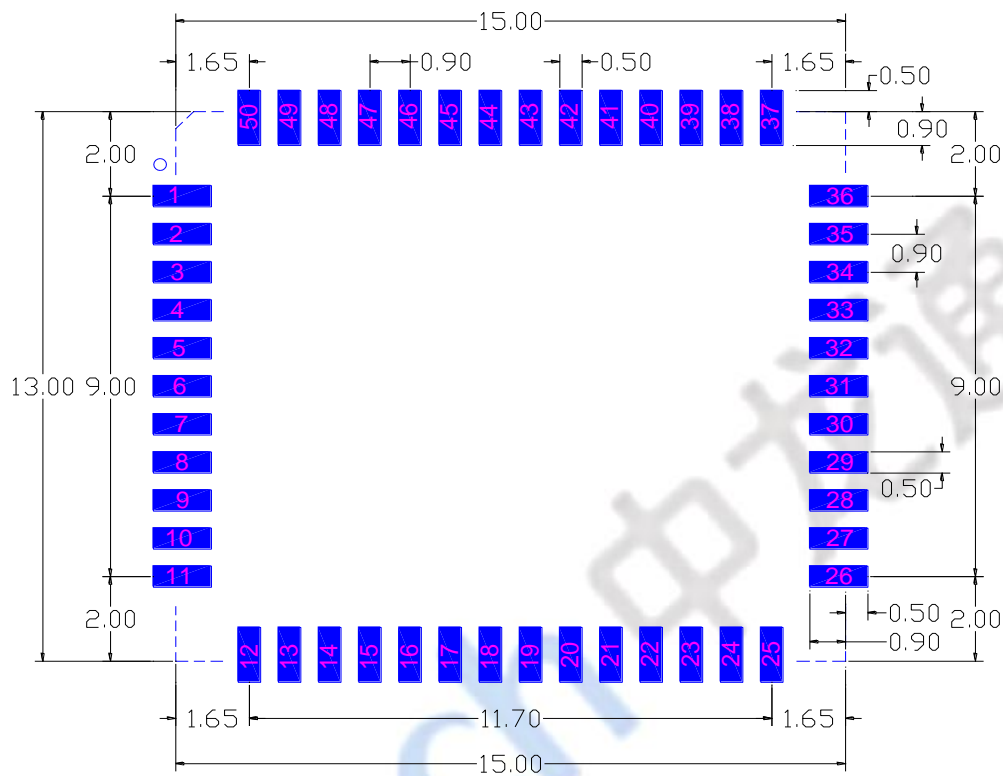
5.3 Recommended Operating Conditions

Table 5-3 Recommended Operating Conditions

Symbol	Parameter	Min.	Typ.	Max.	Unit
AVDD33	Analog supply voltage for 3.3V pin	3.14	3.3	3.63	V
DVDD	Digital supply voltage, core voltage	0.81	0.9	0.99	V
VDDIO	I/O supply voltage	1.62	1.8	1.98	V
Ta	Operating ambient temperature	0		70	°C

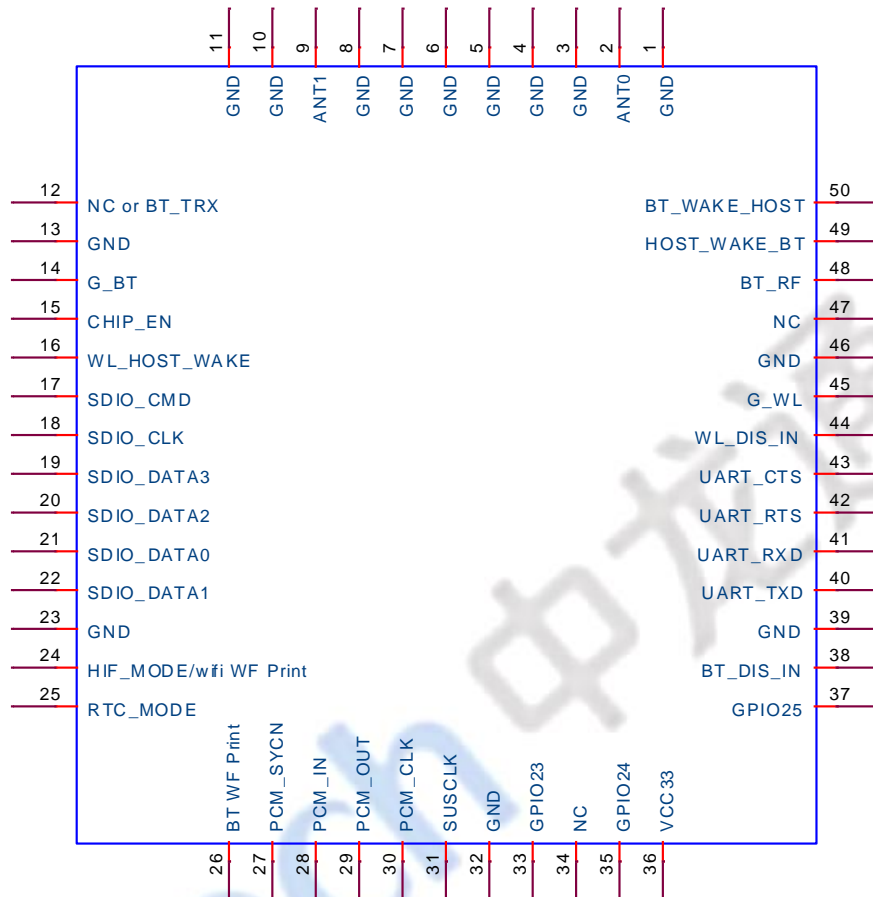
6. Recommended footprint

unit: mm



<Top view>

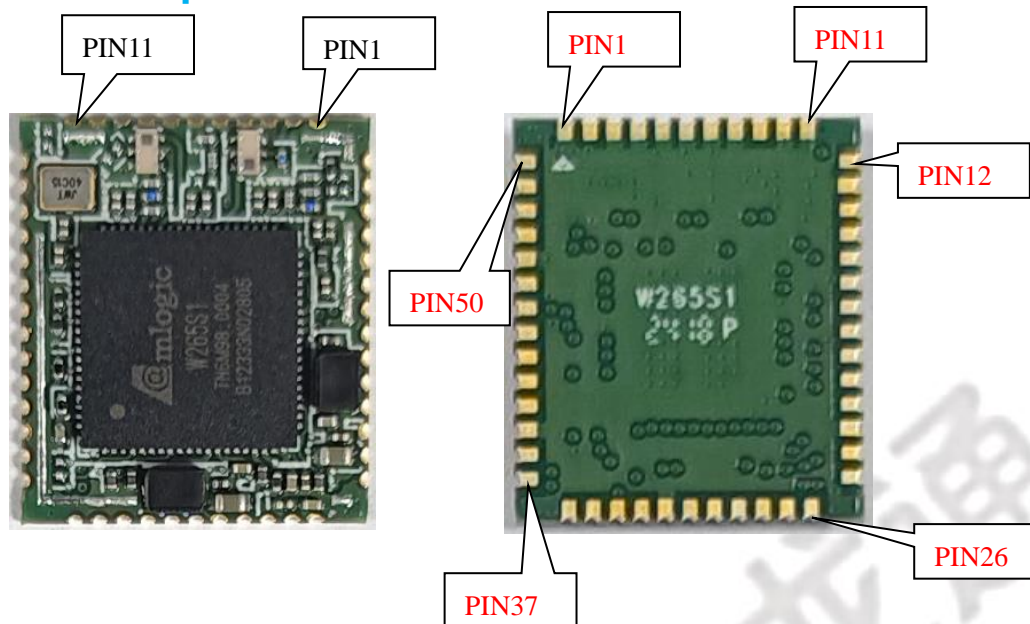
7. Pin Description



NO	Name	Type	De
1	GND	—	Ground connections
2	WL_S0	I/O	WL_ANT0 RF I/O
3~8	GND	—	Ground connections
9	WL_S1	I/O	WL_ANT1 RF I/O
10、11	GND	—	Ground connections
12	BT_ANT	I/O	BT_RF I/O (only for -10/11 module)
13	GND	—	Ground connections
14	G_BT		No connection
15	CHIP_EN	I	SDIO host indication to reset the device
16	WL_WAKE_HOST	O	WL wake up Host
17	SDIO_CMD	I/O	SDIO command line
18	SDIO_CLK	I/O	SDIO CLK
19	SDIO_DATA_3	I/O	SDIO DATA3
20	SDIO_DATA_2	I/O	SDIO DATA2

21	SDIO_DATA_0	I/O	SDIO DATA0
22	SDIO_DATA_1	I/O	SDIO DATA1
23	GND	—	Ground connections
24	HIF_MODE0/WIFI FW	I/O	SDIO General GPIO
25	RTC_MODE	I/O	moudle interface select for external rtc/internal rtc, 0: exter- nal; 1: internal
26	BT FW PRINT	I/O	BT General GPIO
27	PCM_SYNC	I	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	SUSCLK	I/O	Moudle RTC_CLK
32	GND	—	Ground connections
33	GPIO23	I/O	General GPIO
34	NC		No connection
35	GPIO24	I/O	General GPIO
36	VBAT	—	Main power source input($\geq 1500\text{mA}$)
37	GPIO25	I/O	General GPIO
38	BT_DIS_N	I	Low level reset for Bluetooth
39	GND	—	Ground connections
40	UART_TXD	O	Bluetooth UART interface
41	UART_RXD	I	Bluetooth UART interface
42	UART_RTS	O	Bluetooth UART interface
43	UART_CTS	I	Bluetooth UART interface
44	WL_DIS_EN	I	Low level reset for WL
45	NC		No connection
46	GND	—	Ground connections
47	NC		No connection
48	BT_ANT	I/O	BT_RF I/O (only for -00/01 module)
49	HOST_WAKE_BT	I	Host wake up Bluetooth
50	BT_WAKE_HOST	O	Bluetooth wake up Host

8. Modular photo

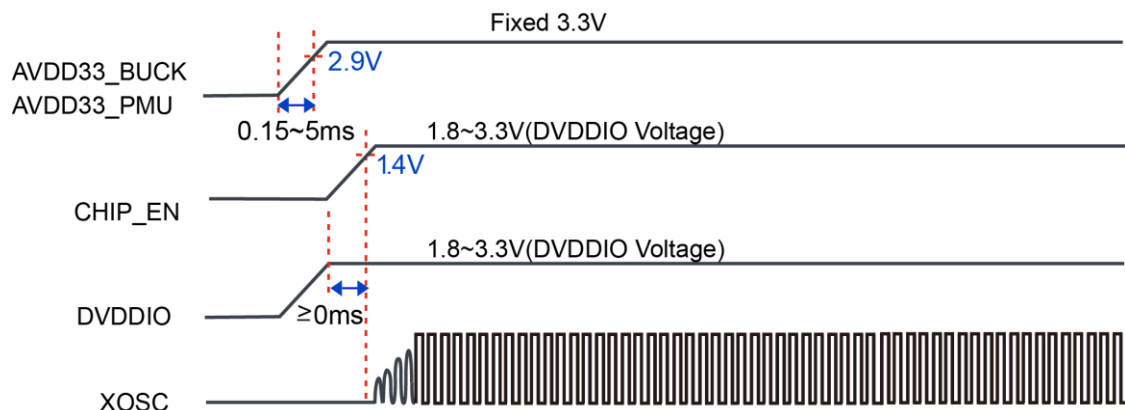


9. Supplier

Supplier list	
Name of Material	Supplier brand
Main chip	Amlogic
Crystal	FJ
PCB	Bomin/Kexiang/Sunlord/Taijing
Diplexer	ACX
Inductor	Sunlord
Capacitance	SAMSUNG
Resistor	UniOhm

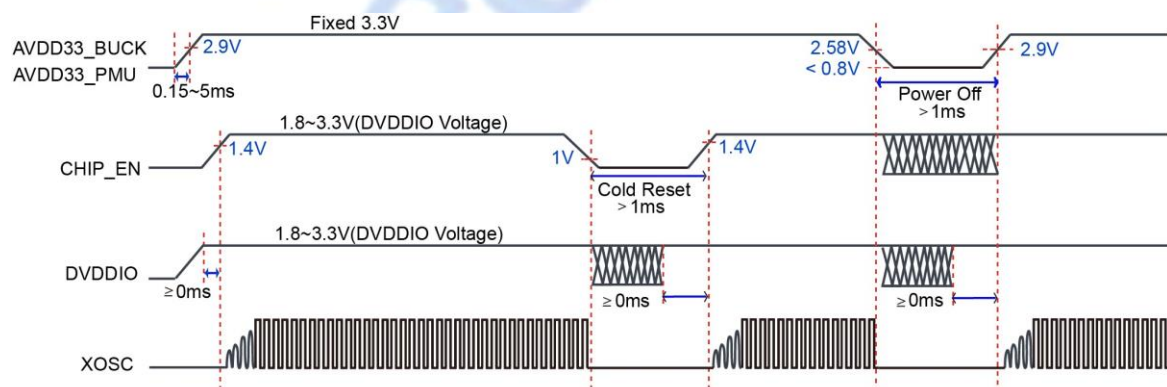
10.1 Power On Sequence

The following figure shows the power on sequence. when AVDD33_PMU, AVDD33_BUCK are 3.3V and CHIP_EN = 1.8 V, start power on sequence.



10.2 Global Reset

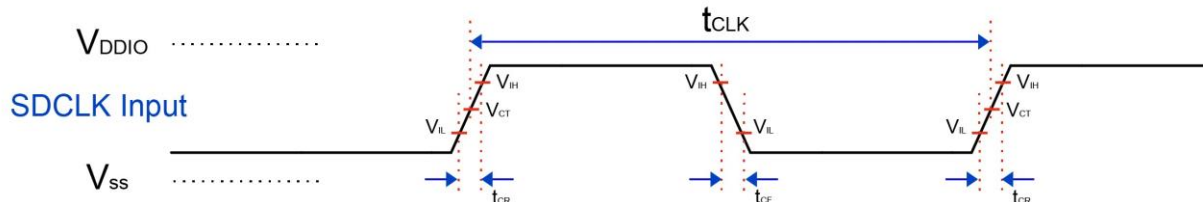
The following figure shows the cold reset sequence. The cold reset is controlled by AVDD33_PMU, AVDD33_BUCK and CHIP_EN



10.3 SDIO Interface Timing

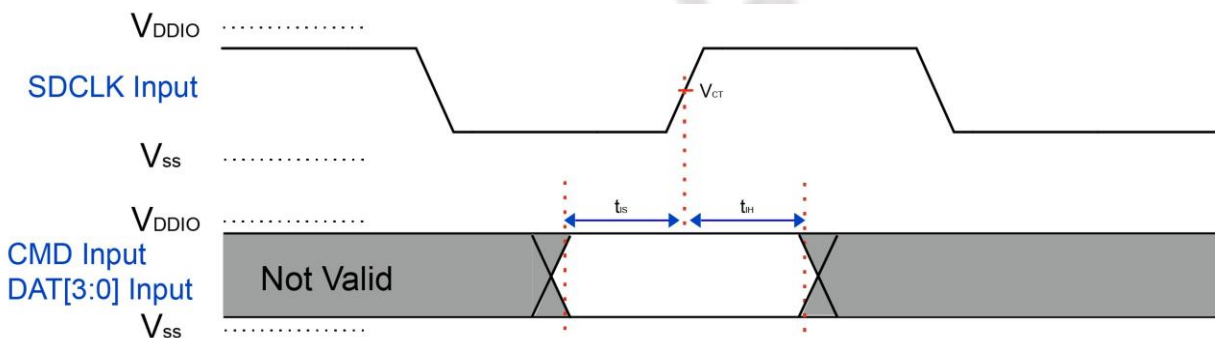
This section describes the bus timing specification in SDR12, SDR25 and SDR104 modes.

Clock Timing



Symbol	Min.	Max.	Unit	Remark
t _{CLK}	4.80	-	ns	208MHz (Max.), Between rising edge, V _{CT} = 0.975V
t _{CR} , t _{CF}	-	0.2 * t _{CLK}	ns	t _{CR} , t _{CF} < 0.96ns (max.) at 208MHz, C _{CARD} = 10pF
Clock Duty	30	70	%	t _{CR} , t _{CF} < 2.00ns (max.) at 100MHz, C _{CARD} = 10pF

Card Input Timing



SDR104 Input Timing

Symbol	Min.	Max.	Unit	Description
t _{IS}	1.40	-	ns	C _{CARD} = 10pF, V _{CT} = 0.975V
t _{IH}	0.80	-	ns	C _{CARD} = 5pF, V _{CT} = 0.975V

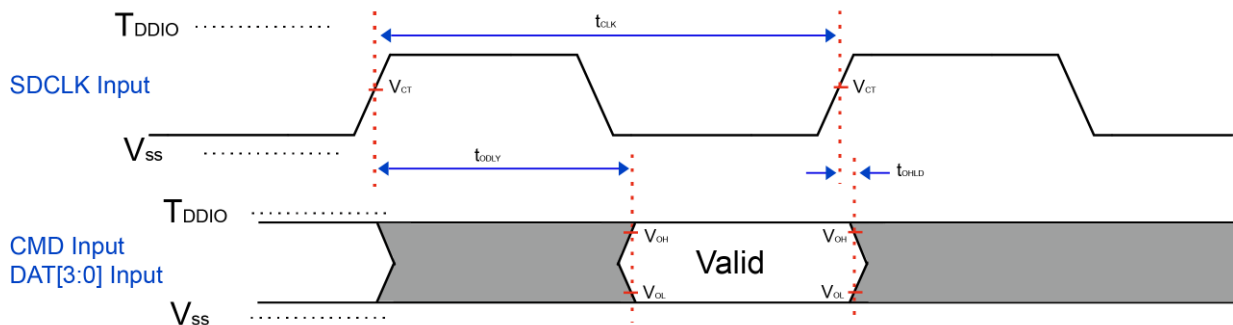
SDR50 Input Timing

Symbol	Min.	Max.	Unit	Description
t _{IS}	3.00	-	ns	C _{CARD} = 10pF, V _{CT} = 0.975V
t _{IH}	0.80	-	ns	C _{CARD} = 5pF, V _{CT} = 0.975V

Card Output Timing

Output Timing of Fixed Data Window (all SDR modes up to 100MHz)

Output Timing of Fixed Data Window

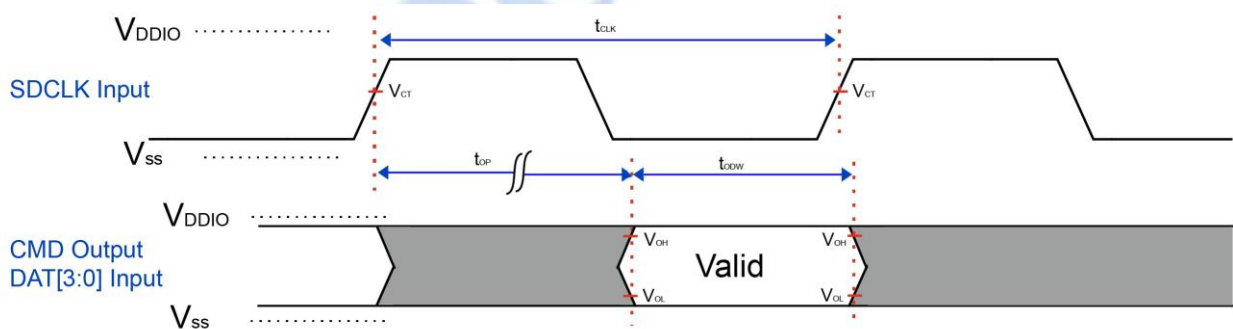


Output Timing of Fixed Data Window

Symbol	Min.	Max.	Unit	Description
t_{ODLY}	-	7.5	ns	$t_{CLK} \geq 10.0\text{ns}$, $C_L = 30\text{pF}$, using driver Type B, for SDR50,
t_{ODLY}	-	14	ns	$t_{CLK} \geq 20.0\text{ns}$, $C_L = 40\text{pF}$, using driver Type B, for SDR25 and SDR12,
t_{OH}	1.5	-	ns	Hold time at the t_{ODLY} (min.), $C_L = 15\text{pF}$

Output Timing of Variable Window (SDR104 up to 208MHz)

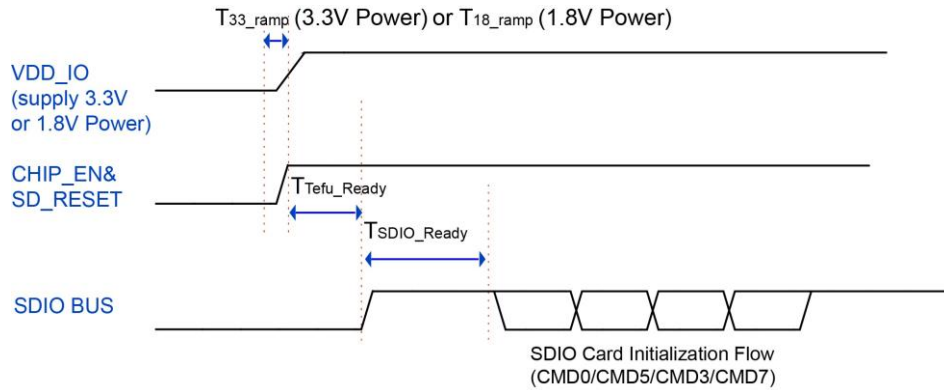
Output Timing of Variable Data Window



Output Timing of Fixed Data Window

Symbol	Min.	Max.	Unit	Description
t_{OP}	0	2	UI	Card Output Phase
Δt_{OP}	-350	+1550	ps	Delay variation due to temperature change after tuning
t_{ODW}	0.60	-	UI	$t_{ODW} = 2.88\text{ns}$ at 208MHz

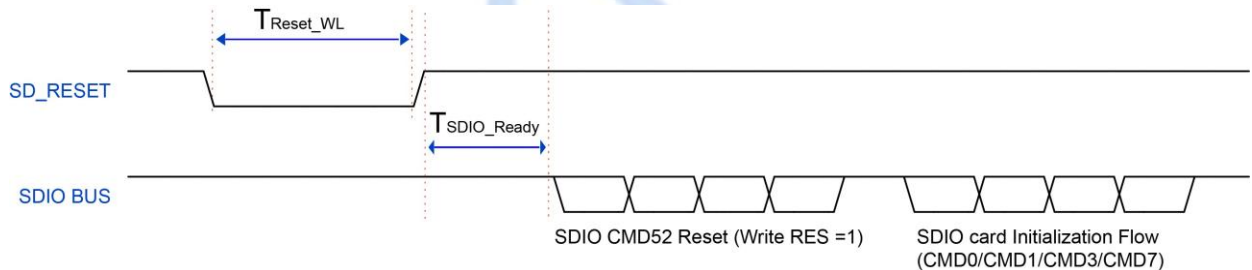
SDIO Power On Sequence



SDIO Power on Timing Parameter

Symbol	Min.	Typical	Max.	Unit	Description
T _{18_Ramp}	0.5	1.5	5	ms	The 1.8V power ramp up duration
T _{33_Ramp}	0.5	1.5	5	ms	The 3.3V power ramp up duration
T _{Tefu_Ready}	200	300	X	ms	WLAN eFuse antoload, T _{Tefu_Ready} = 500ms (Typical)
T _{SDIO_Ready}	8	20	X	ms	SDIO Not Ready Duration. In this state, the SoC may respond to commands without the ready bit being set. After the ready bit is set, the host will initiate complete card detection procedure.

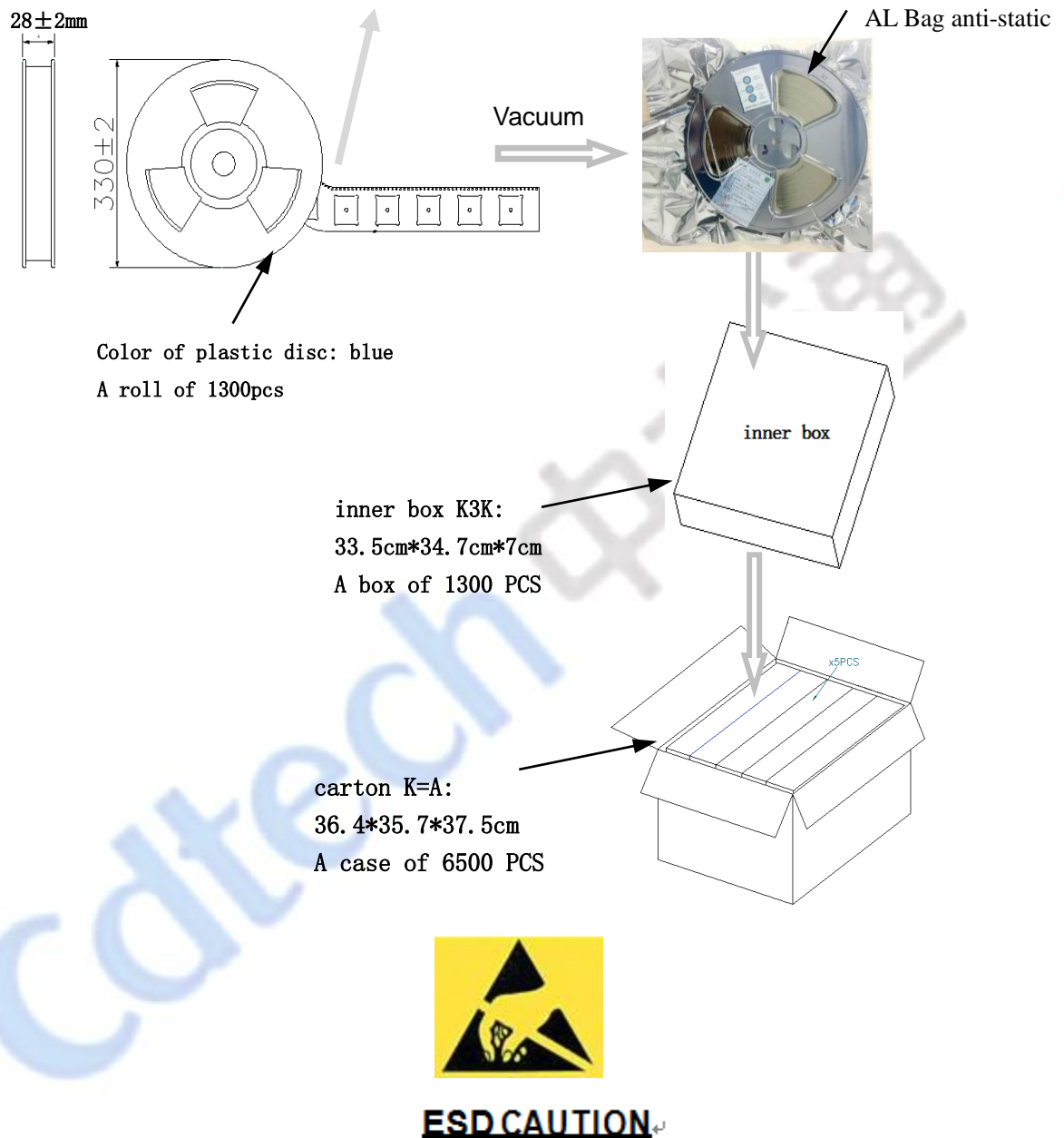
SDIO Reset Sequence



SDIO Reset Timing Parameter

Symbol	Min.	Typical	Max.	Unit	Description
T _{Rset_WL}	100	100	X	ms	SD_RESET keep low duration
T _{SDIO_Ready}	8	20	X	ms	SDID Not Ready Duration. In this state, the SoC may respond to commands without the ready bit being set. After the ready bit is set, the host will initiate complete card detection procedure.

11 Packaging Detail:



The 47W265S is ESD (electrostatic discharge) sensitive device and may be damaged with ESD or spike voltage. Although 47W265S is with built-in ESD protection circuitry, please handle with care to avoid the permanent malfunction or the performance degradation.

FCC WARNING

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

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 device and its antenna(s) must not be co-located or operating in conjunction with any other antenna or transmitter.

15.105 Information to the user.

(b) For a Class B digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

Note: 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 generates, 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.

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20 cm between the radiator and your body.

Radiation Exposure Statement:

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

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

The availability of some specific channels and/or operational frequency bands are country dependent and are firmware programmed at the factory to match the intended destination.

The firmware setting is not accessible by the end user.

The final end product must be labelled in a visible area with the following:

“Contains Transmitter Module FCC ID: 2BFLD-47W265S”

Requirement per KDB996369 D03

2.2 List of applicable FCC rules

List the FCC rules that are applicable to the modular transmitter. These are the rules that specifically establish the bands of operation, the power, spurious emissions, and operating fundamental frequencies. DO NOT list compliance to unintentional-radiator rules (Part 15 Subpart B) since that is not a condition of a module grant that is extended to a host manufacturer. See also Section 2.10 below concerning the need to notify host manufacturers that further testing is required.³

Explanation: This module meets the requirements of FCC part 15C(15.247), FCC Part15 15.407.

2.3 Summarize the specific operational use conditions

Provide all the restrictions imposed by the specific rule(s), that extend to host's and any other notices or regulatory statements require in host's end-user manual. For example, the rule that restricts use to indoor operation, not operated on aircraft, etc.

Explanation: Equipment operating within the frequency band of 5150-5350MHz is for indoor use only

Also describe conditions that are applicable to the modular transmitter, such as including for example any limits on antennas. For example, if point-to-point antennas are used that require reduction in power or compensation for cable loss, for professional installed equipment, then this information must be in the instructions. In addition, certain information may also be needed, such as peak gain per frequency band and minimum gain, specifically for master devices in 5 GHz DFS bands.

Explanation: The EUT has FPC antenna, the module contains 3 unique antenna connector. The maximum gain value of FPC antenna is (2.4GHz band:1.57dBi, 5GHz band:4.58dBi)

2.4 Limited module procedures

The Grantee of a limited module must file with the application for certification a procedure^[6] that describes the proposed method used to ensure host compliance when the limited module is installed in the host product.

If a modular transmitter is approved as a "limited module," then the module manufacturer is responsible for approving the host environment that the limited module is used with. The manufacturer of a limited module must describe, both in the filing and in the installation instructions, the alternative means that the limited module manufacturer uses to verify that the host meets the necessary requirements to satisfy the module limiting conditions.

A limited module manufacturer has the flexibility to define its alternative method to address the conditions that limit the initial approval, such as: shielding, minimum signaling amplitude, buffered modulation/data inputs, or power supply regulation. The alternative method could include that the limited module manufacturer reviews detailed test data or host designs prior to giving the host manufacturer approval. The Grantee can devise a strategy to be approved through a Pre-Approval Guidance (KDB Publication 388624 PAG item MODLIM) inquiry

This limited module procedure is also applicable for RF exposure evaluation when it is necessary to demonstrate compliance in a specific host. The module manufacturer must state how control of

the product into which the modular transmitter will be installed and maintained such that full compliance of the product is always ensured. For additional hosts other than the specific host originally granted with a limited module, a Class II permissive change is required on the module grant to register the additional host as a specific host also approved with the module.

Explanation: The module is a single module.

2.5 Trace antenna designs

If trace antenna designs are applicable, full-detail design specifications are required per D02 Module Q&A Question 11.

For a modular transmitter with trace antenna designs, see the guidance in Question 11 of KDB Publication 996369 D02 FAQ – Modules for Micro-Strip Antennas and traces. The integration information shall include for the TCB review the integration instructions for the following aspects: layout of trace design, parts list (BOM), antenna, connectors, and isolation requirements.⁴

- a) Information that includes permitted variances (e.g., trace boundary limits, thickness, length, width, shape(s), dielectric constant, and impedance as applicable for each type of antenna);
- b) Each design shall be considered a different type (e.g., antenna length in multiple(s) of frequency, the wavelength, and antenna shape (traces in phase) can affect antenna gain and must be considered);
- c) The parameters shall be provided in a manner permitting host manufacturers to design the printed circuit (PC) board layout;
- d) Appropriate parts by manufacturer and specifications;
- e) Test procedures for design verification; and
- f) Production test procedures for ensuring compliance.

The module grantee shall provide a notice that any deviation(s) from the defined parameters of the antenna trace, as described by the instructions, require that the host product manufacturer must notify the module grantee that they wish to change the antenna trace design. In this case, a Class II permissive change application is required to be filed by the grantee, or the host manufacturer can take responsibility through the change in FCC ID (new application) procedure followed by a Class II permissive change application.

Explanation: The module with FPC antenna designs, See antenna report for antenna details.

2.6 RF exposure considerations

It is essential for module grantees to clearly and explicitly state the RF exposure conditions that permit a host product manufacturer to use the module. Two types of instructions are required for RF exposure information: (1) to the host product manufacturer, to define the application conditions (mobile, portable – xx cm from a person's body); and (2) additional text needed for the host product manufacturer to provide to end users in their end-product manuals. If RF exposure statements and use conditions are not provided, then the host product manufacturer is required to take responsibility of the module through a change in FCC ID (new application).

Module Grantees are required to provide an RF exposure (RFX) exhibit for CoU related to fixed, mobile or portable configurations, as defined §2.1091 and §2.1093, as well as per further specification in by KDB Publication 447498. This exhibit shall include an RF exposure compliance statement, as well as references to Maximum Permissible Exposure (MPE) or Specific Absorption Rate (SAR) test reports, as required per KDB 447498.

Modules can only be used in a host for the conditions that it was granted for. To be used in any other way than granted, such as mobile to portable or with other transmitters simultaneously, requires additional evaluation, testing, or testing and Class 2 permissive change.

Explanation: This module complies with FCC RF radiation exposure limits set forth for an uncontrolled environment, this equipment should be installed and operated with a minimum distance of 20 centimeters between the radiator and your body." This module is designed to comply with the FCC statement, FCC ID is: 2BFLD-47W265S.

2.7 Antennas

For Part 15 and licensed CMRS Client devices a list of antennas included in the application for certification must be provided in the instructions. For modular transmitters approved as limited modules, all applicable professional installer instructions must be included as part of the information to the host product manufacturer. The antenna list shall also identify the antenna types (monopole, PIFA, dipole, etc. (note that for example an "omni-directional antenna" is not considered to be a specific "antenna type"))).

For situations where the host product manufacturer is responsible for an external connector, for example with an RF pin and antenna trace design, the integration instructions shall inform the installer that unique antenna connector must be used on the Part 15 authorized transmitters used in the host product. The module manufacturers shall provide a list of acceptable unique connectors.

Licensed (non-client station) Modules for a base, fixed station can be stated as conducted, and antenna data is not required when it is clear that the licensee is responsible for the applicable limits under the rules and or license.

Explanation: The EUT has FPC antenna, the module contains 3 unique antenna connector. The maximum gain value of FPC antenna is (2.4GHz band:1.57dBi, 5GHz band:4.58dBi)

2.8 Label and compliance information

Grantees are responsible for the continued compliance of their modules to the FCC rules. This includes advising host product manufacturers that they need to provide a physical or e-label stating "Contains FCC ID" with their finished product. See Guidelines for Labeling and User Information for RF Devices – KDB Publication 784748.

Explanation: The host system using this module, should have label in a visible area indicated the following texts: "Contains FCC ID: 2BFLD-47W265S"

2.9 Information on test modes and additional testing requirements

Additional guidance for testing host products is given in KDB Publication 996369 D04 Module Integration Guide. Test modes should take into consideration different operational conditions for a stand-alone modular transmitter in a host, as well as for multiple simultaneously transmitting modules or other transmitters in a host product.

The grantee should provide information on how to configure test modes for host product evaluation for different operational conditions for a stand-alone modular transmitter in a host, versus with multiple, simultaneously transmitting modules or other transmitters in a host.

Grantees can increase the utility of their modular transmitters by providing special means, modes, or instructions that simulates or characterizes a connection by enabling a transmitter. This can

greatly simplify a host manufacturer's determination that a module as installed in a host complies with FCC requirements.

Explanation: Can increase the utility of our modular transmitters by providing instructions that simulates or characterizes a connection by enabling a transmitter.

2.10 Additional testing, Part 15 Subpart B disclaimer

The grantee should include a statement that the modular transmitter is only FCC authorized for the specific rule parts (i.e., FCC transmitter rules) listed on the grant, and that the host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. If the grantee markets their product as being Part 15 Subpart B compliant (when it also contains unintentional-radiator digital circuitry), then the grantee shall provide a notice stating that the final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.⁶

Explanation: The module is only FCC authorized for the specific rule parts listed on the grant. The OEM integrator is responsible for testing their end-product for any additional compliance requirements required with this module installed. If the final product contains circuits of other FCC PART 15 Subparts, the final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.

2.11 Note EMI Considerations

Note that a host manufacture is recommended to use D04 Module Integration Guide recommending as "best practice" RF design engineering testing and evaluation in case non-linear interactions generate additional non-compliant limits due to module placement to host components or properties

Explanation: The host manufacturer is strongly recommended to confirm compliance with FCC requirements for the transmitter when the module is installed in the host. This module is a stand-alone modular. If the end product will involve the Multiple simultaneously transmitting condition or different operational conditions for a stand-alone modular transmitter in a host, the host manufacturer has to consult with the module manufacturer for the installation method in the end system. Host manufacturer is recommended to use D 04 Module Integration Guide. The final host product may also need to be evaluated against FCC rule part 15 Subpart B (criteria for unintentional radiators) in order to be properly authorized for operation as part 15B

2.12 How to make changes

Since. only Grantees are permitted to make permissive changes, it is recommended that module manufactures provide contact information and some guidance to host providers in the integration instructions if they expect their module will be used differently than granted.

Explanation: Module manufacturer contact: Tel: (86 755) 81449957, E-mail: Info@cdtech.cn

Antenna information:

	ANT Type	Manufacturer	Model	Peak Gain
WIFI and BT Antenna	FPC antenna	SHENZHEN Xingyuanchuang TECHNOLOGY CO.,LTD	truck-FP7R2	2.4G BAND: 1.57dBi
				5.1G BAND: 0.38dBi
				5.3G BAND: 0.76dBi
				5.6G BAND: 4.58dBi
				5.8G BAND: 4.15dBi