

CDI-W691612A-00

DATASHEET

WiFi 6 11ax + BT5.0 Module

Software:

客 户 Customer	客户承认 Approve（请盖印章）	日 期 Date

拟制 Design	审核 Check	批准 Approve	版本 Version	日期 Date
			V1.1	2026.05.08

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更改记录:

Reversion History:

版本 Version	日期 Date	更改内容 Modification
1.0	2025.09.25	First release
1.1	2026.05.08	Update module parameters

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1. Overview

CDI-W691612A-00 is a Wi-Fi + BLE module independently developed by Cdtech based on the SCM1612A-H4H chip. SCM1612A-H4H is a highly integrated 1T1R Wi-Fi 6 + BLE 5.0 combo chip, with integrated Zigbee 3.0 and Thread SoC functions based on 802.15.4, equipped with an MCU, suitable for ultra-low-power and low-cost IoT applications. SCM1612A-H4H integrates a 32-bit RISC-V processor with ample storage, rich peripheral interfaces, and a more secure encryption mechanism.

2. Features

WIFI

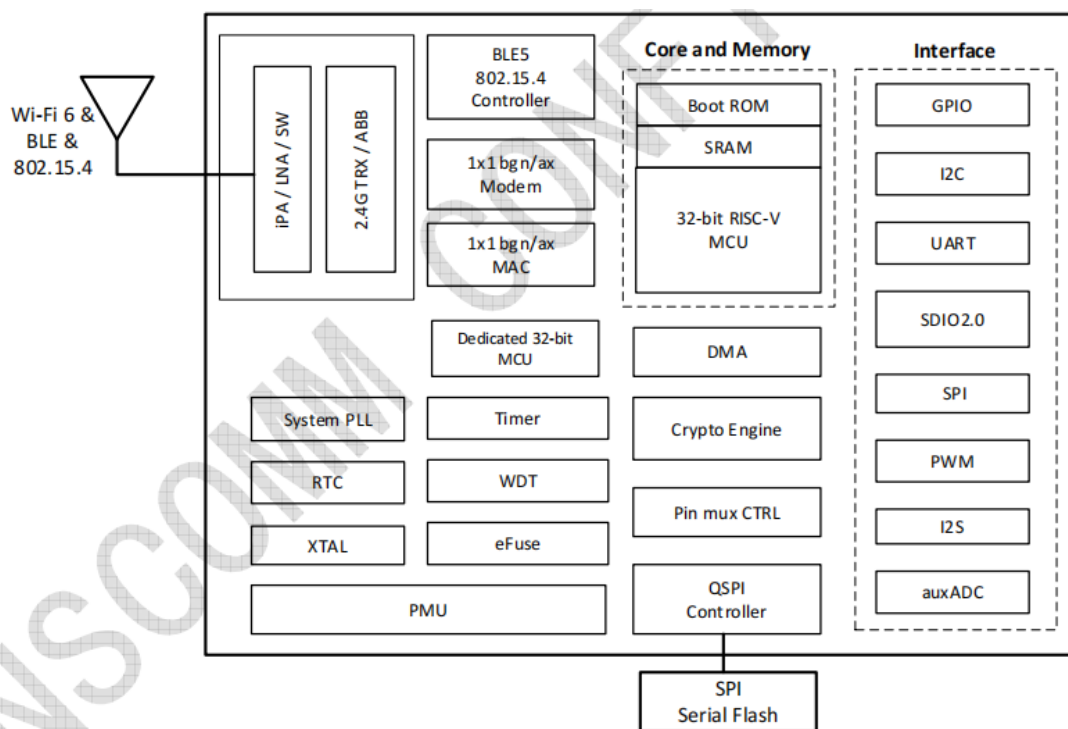
- IEEE 802.11 b/g/n/ax compliant
- 11b/g/n 20/40MHz bandwidth and 11ax 20MHz in 2.4GHz band
- 1T1R mode with data rate up to MCS 7
- Support DL/UL OFDMA
- Support RX STBC
- Support TWT
- Security support for WPA WPA2/WPA3 personal
- Support IEEE 802.11e and Wi-Fi Multimedia (WMM)
- Supports 802.11w protected managed frame
- TX/RX A-MPDU, RX A-MSDU
- Fragmentation and defragmentation

- Mixed mode, legacy modes support
- Support SoftAP mode and simultaneous station + SoftAP mode
- Integrated LNA, PA and T/R switch
- Wi-Fi and BLE coexistence under shared antenna environment
- Low power consumption

Bluetooth

- Bluetooth LE 5.2 compliant (BQB certified)
- Data rate 1Mbps, 2Mbps, Long range 125kbps and 500kbps
- Auto acknowledgement, retransmission and flow control
- Advertising extensions
- Long data and Adv packets (max. 1650 bytes)
- Channel selection algorithm #2
- Both central and peripheral modes
- Integrated Balun and PA

3. Block Diagram



4. General Specification

Model	CDI-W691612A-00
Product Name	WLAN 802.11b/g/n/ax UART 1T1R + BT 5.0 module
Major Chipset	SCM1612A-H4H
Standard	802.11 b/g/n/ax
WiFi Interface	UART、SPI、I2C 、I2S 、PWM、SDIO2.0、auxADC、GPIO
Power Supply Voltage	DC 3.0~3.6V
Operating Temperature	-20~+70° C ambient temperature
Storage Temperature	-40~+85° C ambient temperature
Humidity	5 to 90 % maximum (non-condensing)
ESD Protection	±2KV
Dimension	20.3x15.8x3.5mm (LxWxH) ±0.2mm

5. RF Specification

A. 2.4GHz RF Specification

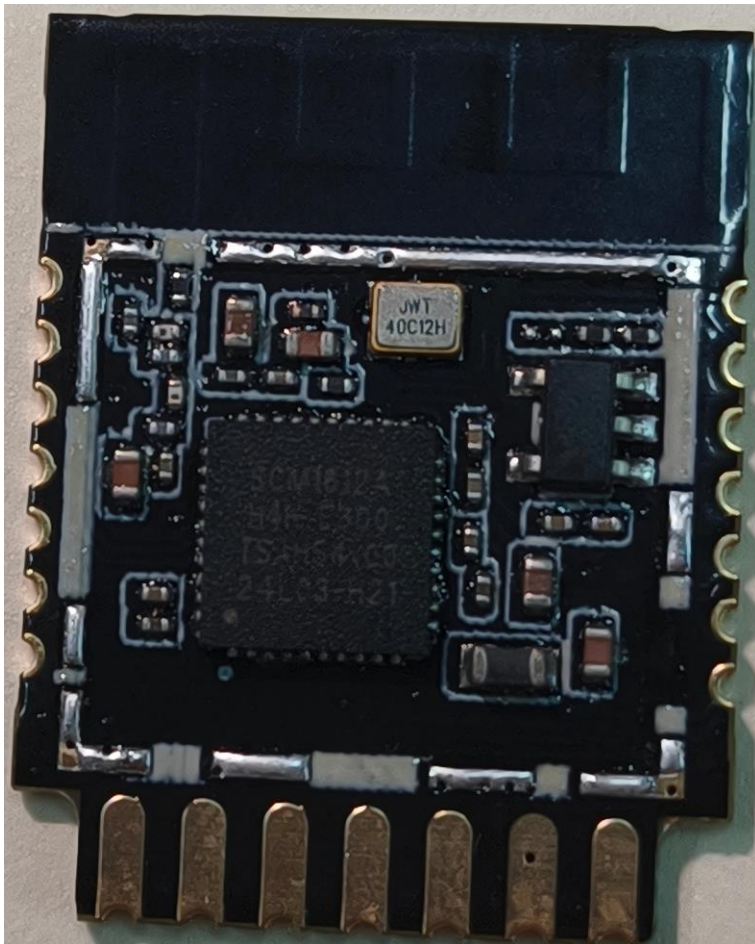
Feature	Description
WLAN Standard	IEEE 802.11b/g/n/ax WiFi compliant
Frequency Range	2.400 GHz ~ 2.484 GHz (2.4 GHz ISM Band)
Number of Channels	2.4GHz : Ch1 ~ Ch14
Modulation	802.11b : DQPSK, DBPSK, CCK 802.11 g/n : OFDM /64-QAM,16-QAM, QPSK, BPSK 802.11 ax : OFDMA /1024-QAM,256-QAM, 64-QAM, 16-QAM, QPSK, BPSK
Output Power	802.11b / 1Mbps : 18dBm $\pm$ 2 dB @ EVM $\leq$ -10dB 802.11b /11Mbps : 18dBm $\pm$ 2 dB @ EVM $\leq$ -10dB
	802.11g / 6Mbps : 18dBm $\pm$ 2 dB @ EVM $\leq$ -5dB 802.11g /54Mbps : 15 dBm $\pm$ 2 dB @ EVM $\leq$ -25dB
	802.11n /MCS0(20M) : 17 dBm $\pm$ 2 dB @ EVM $\leq$ -5dB 802.11n /MCS0(40M) : 16 dBm $\pm$ 2 dB @ EVM $\leq$ -5dB 802.11n /MCS7 : 13 dBm $\pm$ 2 dB @ EVM $\leq$ -27dB
	802.11ax /HE0(20/40M) : 17 dBm $\pm$ 2 dB @ EVM $\leq$ -5dB 802.11ax /HE11(20/40M) : 12 dBm $\pm$ 2 dB @ EVM $\leq$ -27dB
Receive Sensitivity (11b,20MHz) @8% PER	- 1Mbps PER @ -92dBm, typical
	- 2Mbps PER @ -90 dBm, typical
	- 5.5Mbps PER @ -90 dBm, typical
	- 11Mbps PER @ -85 dBm, typical
Receive Sensitivity (11g,20MHz) @10% PER	- 6Mbps PER @ -88 dBm, typical
	- 9Mbps PER @ -86 dBm, typical
	- 12Mbps PER @ -86 dBm, typical
	- 18Mbps PER @ -83 dBm, typical
	- 24Mbps PER @ -82 dBm, typical
	- 36Mbps PER @ -80 dBm, typical
	- 48Mbps PER @ -79 dBm, typical
	- 54Mbps PER @ -71 dBm, typical
Receive Sensitivity	- MCS=0 PER @ -86 dBm, typical
	- MCS=1 PER @ -95 dBm, typical

(11n,20MHz) @10% PER	- MCS=2	PER @ -85 dBm, typical
	- MCS=3	PER @ -84 dBm, typical
	- MCS=4	PER @ -80 dBm, typical
	- MCS=5	PER @ -78 dBm, typical
	- MCS=6	PER @ -77 dBm, typical
	- MCS=7	PER @ -69 dBm, typical
Receive Sensitivity (11n,40MHz) @10% PER	- MCS=0	PER @ -80 dBm, typical
	- MCS=1	PER @ -81 dBm, typical
	- MCS=2	PER @ -81 dBm, typical
	- MCS=3	PER @ -78 dBm, typical
	- MCS=4	PER @ -75 dBm, typical
	- MCS=5	PER @ -74 dBm, typical
	- MCS=6	PER @ -73 dBm, typical
	- MCS=7	PER @ -65 dBm, typical
Receive Sensitivity (11ax,20MHz) @10% PER	- HE=0	PER @ -79 dBm, typical
	- HE=1	PER @ -78 dBm, typical
	- HE=2	PER @ -78 dBm, typical
	- HE=3	PER @ -78 dBm, typical
	- HE=4	PER @ -78 dBm, typical
	- HE=5	PER @ -77 dBm, typical
	- HE=6	PER @ -75 dBm, typical
	- HE=7	PER @ -73 dBm, typical
	- HE=8	PER @ -70 dBm, typical
	- HE=9	PER @ -64 dBm, typical
Maximum Input Level	802.11b : -10 dBm	
	802.11g/n/ax : -20 dBm	
Antenna Reference	Small antennas with 0~2 dBi peak gain	

B. Bluetooth Specification

Wireless Standard	Bluetooth® V5.0 specification
Frequency Band	2.402~2.480 GHz
RF TX Output Power	3~7dBm
RX Sensitivity	-90dBm (typical)

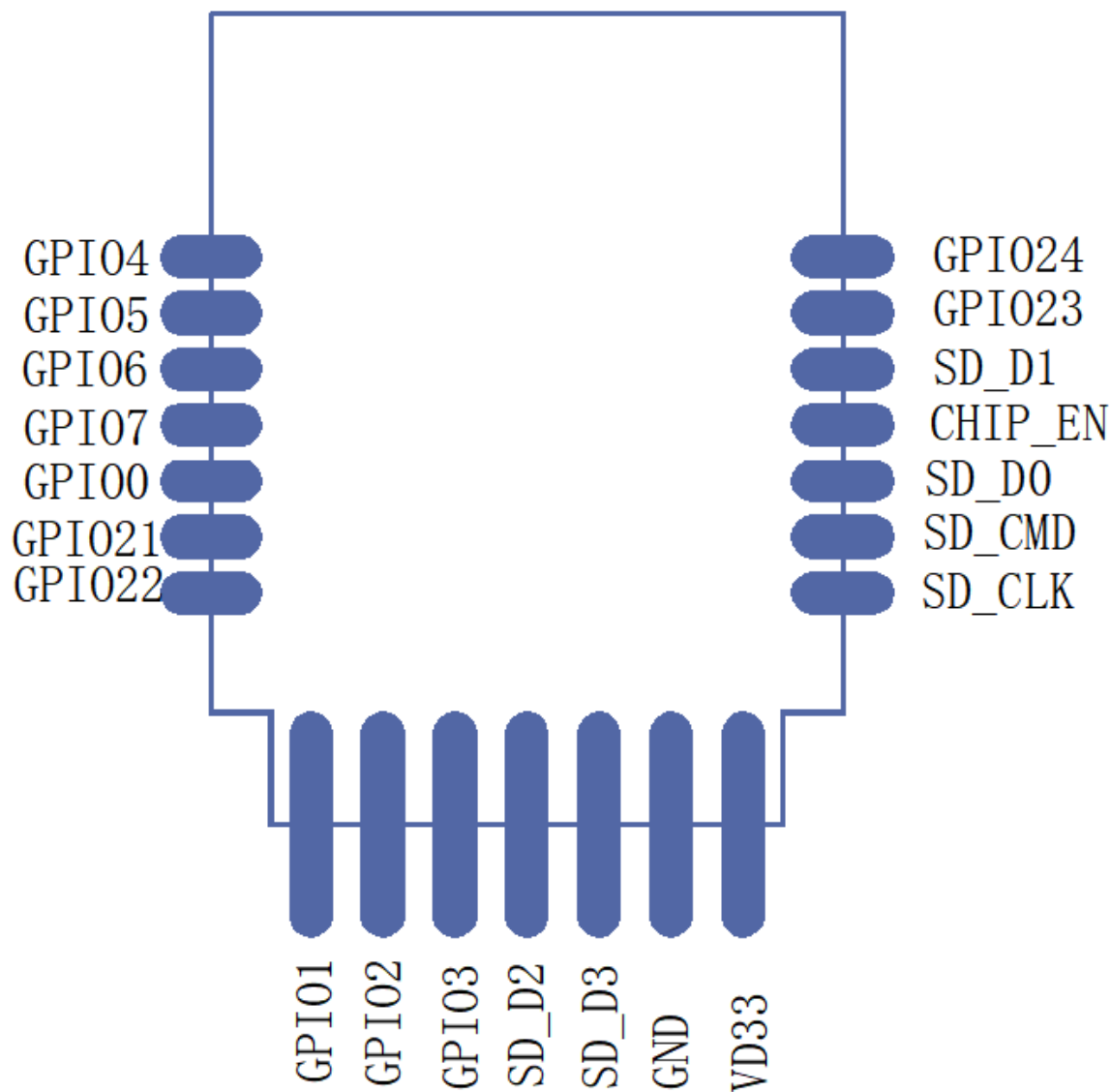
6. Module photo&PIN Description



(TOP VIEW)



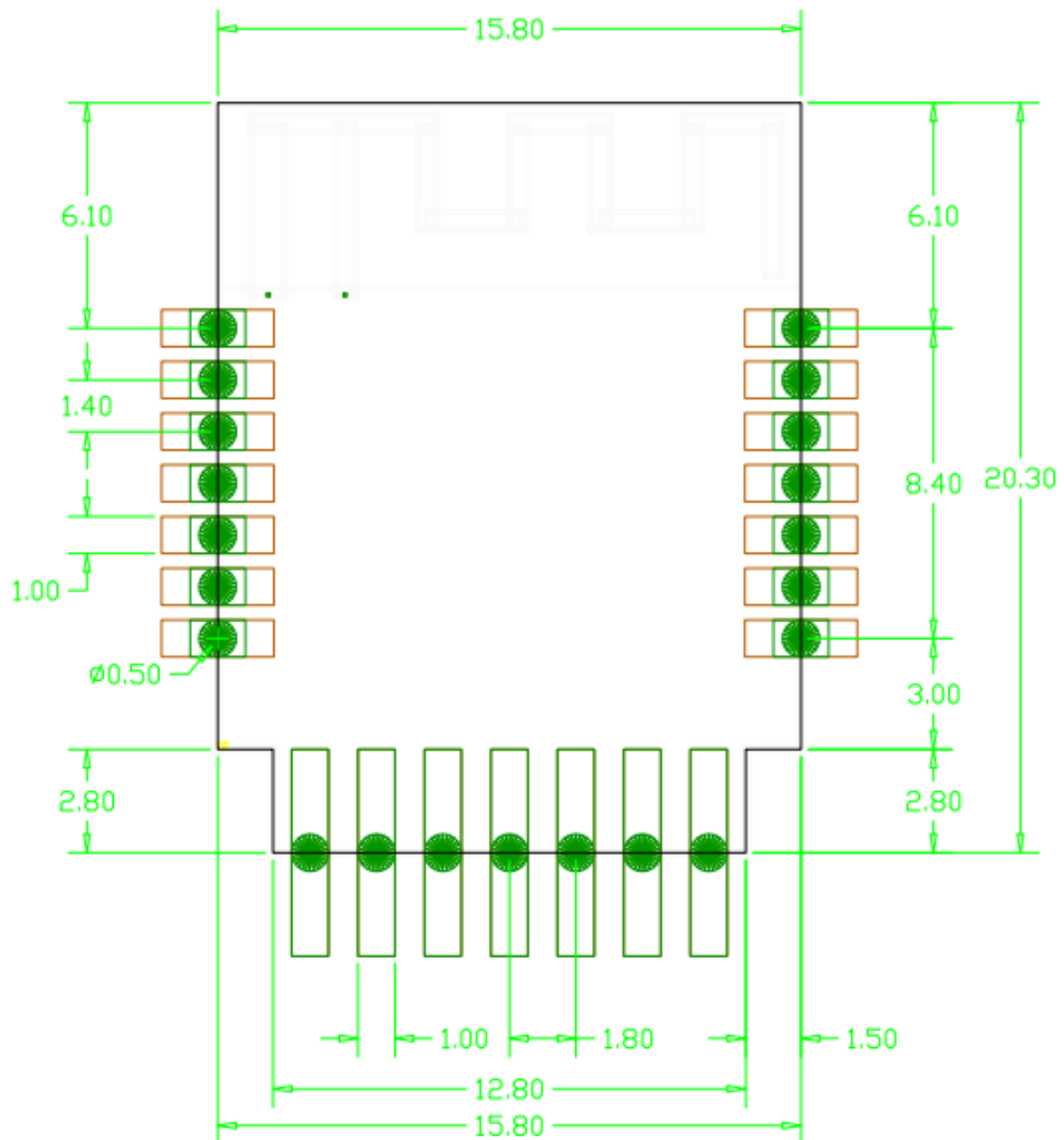
(BOTTOM VIEW)



PIN NO.	NAME	TYPE	FUNCTION
1	GPIO4	I/O	JTAG_TCK/SDIO_CLK/I2S_LRCLK / UART2_RXD/SPI2_DAT0/I2C1_SCL /PWM4/GPIO4/BT_ANT_SEL_2; auxADC_CH4
2	GPIO5	I/O	JTAG_TDO/SDIO_CMD/I2S_DAC_DATA/UART2_TXD/SPI2_DAT1/I2C 1_SDA/PWM5/GPIO5/BT_ANT_SEL_3
3	GPIO6	I/O	I2C1_SCL/SDIO_DATA0/I2S_BCLK/ UART1_RXD/SPI2_DAT2/PWM6/ GPIO6
4	GPIO7	I/O	I2C1_SDA/SDIO_DATA1/I2S_MCLK/UART1_TXD/SPI2_DAT3/PWM7

			/GPIO7 /auxADC_CH5
5	GPIO0	I/O	UART1_RXD/UART2_RXD/UART0_RXD/PWM0/GPIO0; auxADC_CH6
6	GPIO21	I/O	UORXD, GPIO21
7	GPIO22	I/O	UOTXD, GPIO22
8	GPIO1	I/O	JTAG_TDI/SDIO_DATA3/I2S_ADC - DATA/SPI2_CLK/I2C0_SDA/PWM3/GPIO3/BT_ANT_SEL_1;
9	GPIO2	I/O	I2C1_SDA/SDIO_DATA1/I2S_MCLK/UART1_TXD/SPI2_DAT3/PWM7/GPIO7 /auxADC_CH5
10	GPIO3	I/O	I2C1_SCL/SDIO_DATA0/I2S_BCLK/UART1_RXD/SPI2_DAT2/PWM6/GPIO6
11	SD_D2	I/O	SD_D2
12	SD_D3	I/O	SD_D3
13	GND	Power ground	Ground
14	VDD33	Power VBAT	power supply
15	SD_CLK	I/O	SD_CLK
16	SD_CMD	I/O	SD_CMD
17	SD_D0	I/O	SD_D0
18	CHIP_EN	I	Chip Enable, active high
19	SD_D1	I/O	SD_D1
20	GPIO23	I/O	I2C0_SCL/SPI2_DAT0/PWM2/GPIO23/BLE_STATUS
21	GPIO24	I/O	I2C0_SDA/SPI2_DAT1/PWM3/GPIO24/WIFI_DENY

7. Physical Dimensions



8. Electrical specification

8.1 Power consumption characteristics:

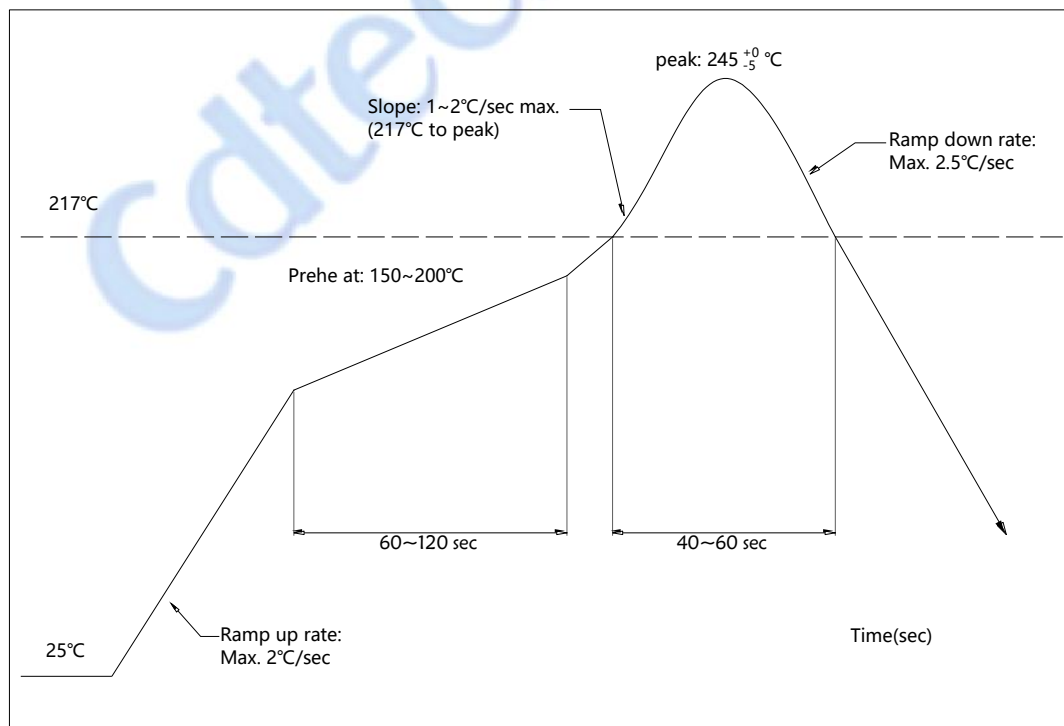
work pattern	describe		Min (mA)	Typical (25°C) (mA)	MAX (mA)
Active (RF work)	TX	802.11b, 20 MHz, 1 Mbps, @21 dBm		198	
		802.11g, 20 MHz, 54 Mbps, @17 dBm		159	
		802.11n, 20 MHz, MCS7, @16.5 dBm		157	
		802.11n, 40 MHz, MCS7, @16 dBm		157	
		802.11ax, HE20, MCS 7, @15.5 dBm		142	
	RX	802.11b only, HT20	34	38	42
		802.11b/g/n, 20 MHz		50	
		802.11n, 40 MHz		58	
		802.11ax, HE20		51	

9. Recommended Reflow Profile

Referred IPC/JEDEC standard.

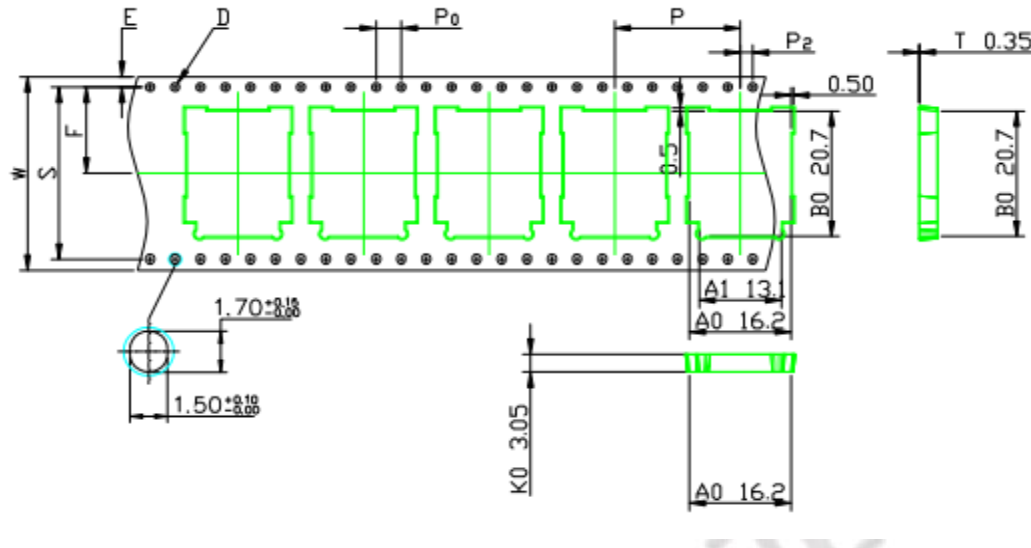
Peak Temperature : <250°C

Number of Times : ≤2 times

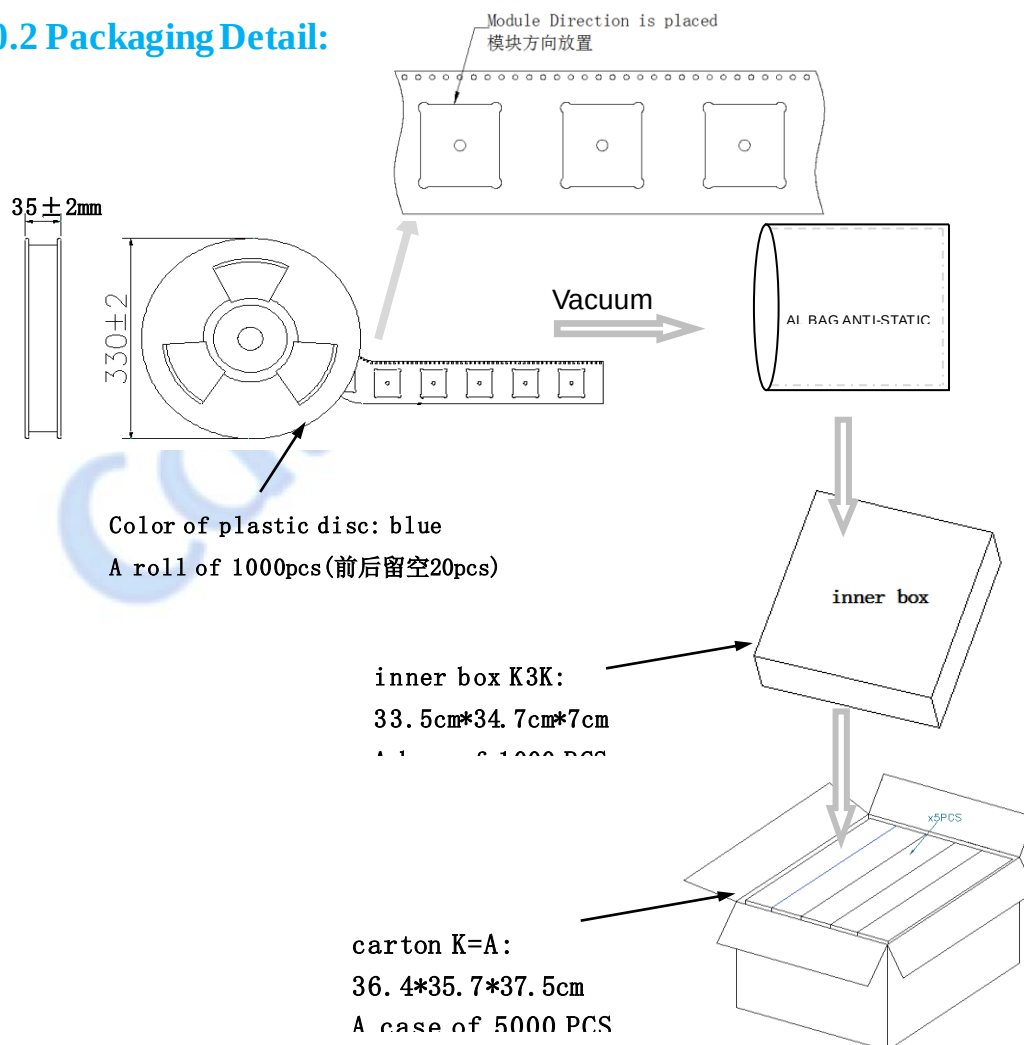


10. Packing information

10.1 Carrier size Detail:



10.2 Packaging Detail:



**ESD CAUTION**

The CDI-W691612A-00 module is ESD (electrostatic discharge) sensitive device and may be damaged with ESD or spike voltage. Although CDI.W691612A-00 module is with built-in ESD protection circuitry, please handle with care to avoid the permanent malfunction or the performance degradation.

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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: ROW-W691612A-00”

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).

2.3 Summarize the specific operational use conditions

Describe use conditions that are applicable to the modular transmitter, including for example any limits on antennas, etc. For example, if point-to-point antennas are used that require reduction in power or compensation for cable loss, then this information must be in the instructions. If the use condition limitations extend to professional users, then instructions must state that this information also extends to the host manufacturer's instruction manual. In addition, certain information may also be needed, such as peak gain per frequency band and minimum gain.

Explanation: The EUT only have one PCB antenna, Yes, the module contains a permanently attached antenna, The antenna gain is -0.74dBi. The use condition of the prototype is mobile.

2.4 Limited module procedures

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.

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 will be 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

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.

- 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: No, The module has no tracking antenna design, is PCB antenna.

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).

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: ROW-W691612A-00

2.7 Antennas

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.

Explanation: The EUT only have one PCB antenna, Yes, the module contains a permanently attached antenna, The antenna gain is -0.74dBi.

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: ROW-W691612A-00

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: WiFiRanger, A CHINA DRAGON TECHNOLOGY LIMITED 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.

Explanation: The host should be evaluated by the FCC Subpart B.

This product uses PCB antenna with a maximum antenna gain -0.74dBi,

2.11 Note EMI Considerations

Note that a host manufacturer 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

For standalone mode, reference the guidance in D04 Module Integration Guide and for simultaneous mode⁷; see D02 Module Q&A Question 12, which permits the host manufacturer to confirm compliance.

Explanation: The customer is an independent module and has been implemented in accordance with D04.

2.12 How to make changes

Since only Grantees are permitted to make permissive changes, it is recommended that module manufacturers 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: Contact Information: We have provided our technical support contact (email: songxiaoyue@cdtech.cn) for host manufacturers to reach us regarding any proposed changes to the module's operational conditions or integration method.