GD32W515_MD1 User Manual

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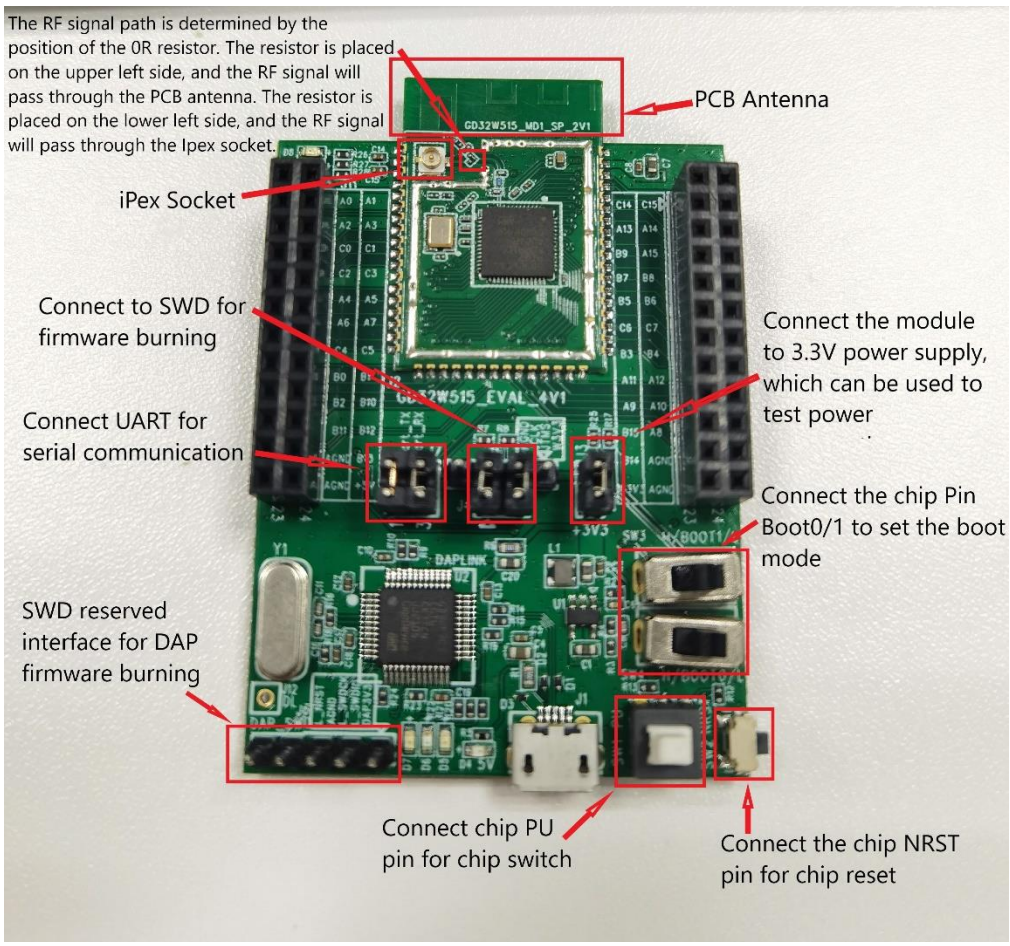
1 Test Preparation

1.1 Hardware Configuration

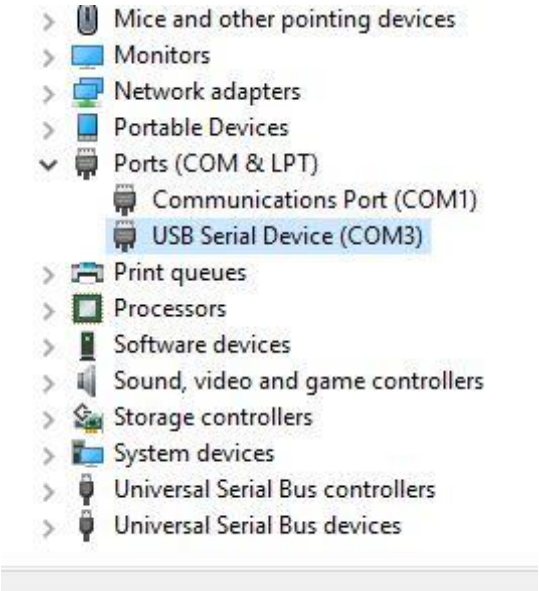
1. The module(on which the Wi-Fi chip “GD32W515” is mounted) to be tested is shown in the figure below, where the EVAL board provides communication and power supply configurations for the module.
2. Before testing, make sure that the five jumpers shown in the picture are all connected, and the two dip switches on the lower right side need to be turned to the right.
3. The bottom right square button needs to be pressed to ensure that the module can be used. The side button at the bottom right corner is the reset button.
4. After connecting the USB cable to the computer, power supply and serial communication can be realized.

Module to be tested	GD32W515_MD1_SP_2V1
Corresponding to the EVAL	GD32W515_EVAL_4V1

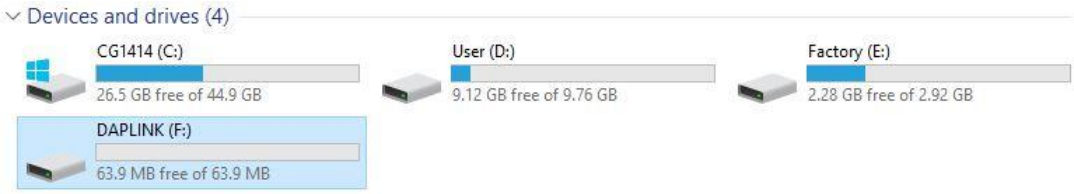


1.2 Software Configuration

1. Driver installation: After the EVAL board hardware and test system are set up, connect the EVAL board and the PC with a USB cable. First install the USB-Serial driver **"mbedWinSerial_16466.rar"** on the PC side. After decompression, double-click the .exe file to install. After the installation is complete, you can see the serial device and its serial number in the "Device Manager" on the PC side.



2. After the driver is installed, you can see the new "**DAPLINK**" drive letter in the PC-"**Explorer**", copy and paste the **RF test firmware** to this drive letter and wait a while, the firmware of the Wi-Fi chip can be burned, press the reset button to restart the chip.

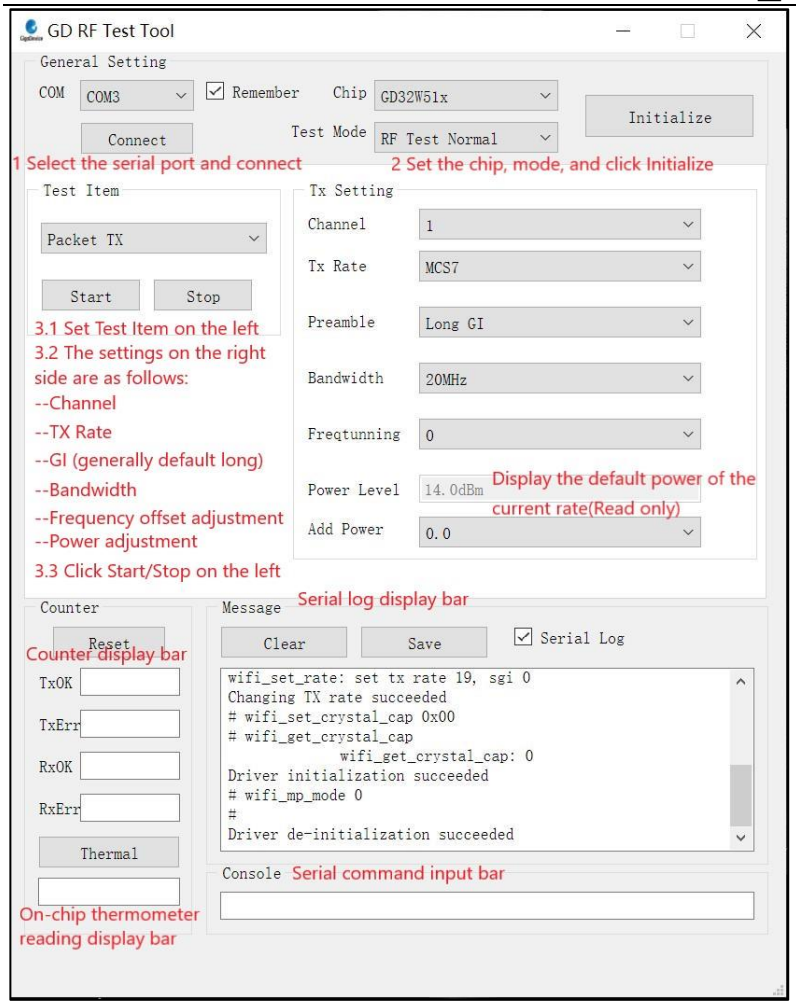


3. To start the test, use the test tool or serial port command. It is recommended to use the test tool to do the test.

2 Using of RF Test Tool

2.1 Introduction to the tool

The following figure shows the interface and function description of the RF test tool named "**GD RF Test Tool**" used by the GD Wi-Fi chip.



2.2 Test initialization

1. Serial port connection: select the serial port number from the "**COM**" drop-down menu in the tool interface, and click the button "**Connect**". At this time, the text displayed on the button will change to "**Disconnect**", indicating that the serial port is successfully connected. Otherwise, please check the serial port connection.

2. Mode setting: The default "**RF Test Normal**" does not need to be changed, it takes effect after clicking "**Initialize**", and then the button displays the text "**De-initialize**", indicating that the RF Test Normal mode has been successfully entered. (Please note that the mode must not be wrong).

3. If the development board is restarted or replaced with other development boards during the test, you need to repeat steps 1-2. If the button is displayed as the previous state "Disconnect" and "De-initialize" at this time, you need to press it twice in succession to reconnect and initialize the serial port.

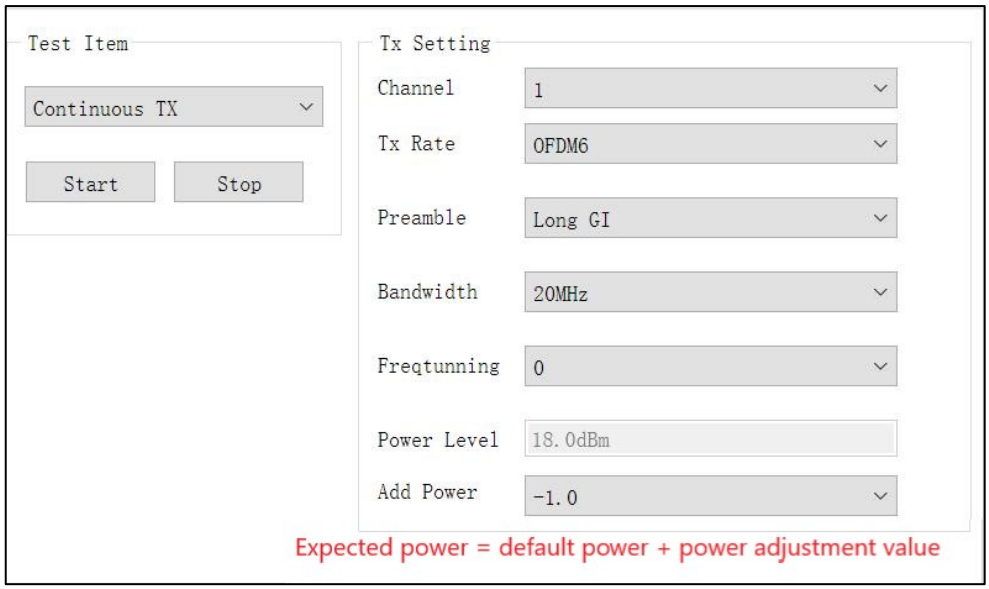
2.3 Continuous Packet TX test

This test item is defined as tx duty=100% modulated signal, used for certification test.

1. DUT settings: Set "**Test Item**" in the tool interface to "**Continuous TX**", and set options such as "**Channel**", "**Rate**", and "**Bandwidth**".

2. After the above settings are completed, the lower "**power level**" column will automatically display the default power for this rate. Adjust the transmit power by setting the "**add power**" value, and then click "**Start**", and the chip will start TX RF signal.
3. The opposite instrument receives the signal and starts the test.
4. TX adjustment: If need to modify any of the above settings, click "**Stop**" to stop tx, then modify the settings, and then click "**Start**" to start the test.
5. For "**add power**", it is used to adjust the transmit power, step unit = 0.25db, expected power = default power ("**power level**") + power adjustment value ("**add power**").

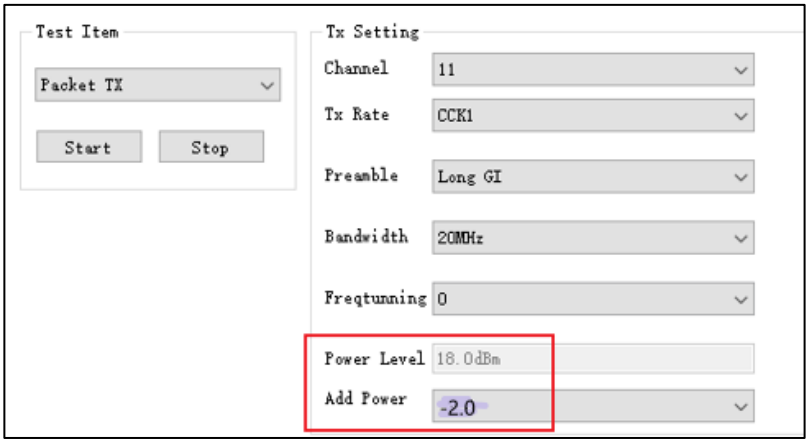
As shown in the figure below, it means channel=1(2412MHz), rate=11G 6M, power=17dbm, continuous tx.



2.4 Transmit power setting

The following table describes the setting parameters of the test tool. The target power is achieved by adjusting the "add power" parameter.

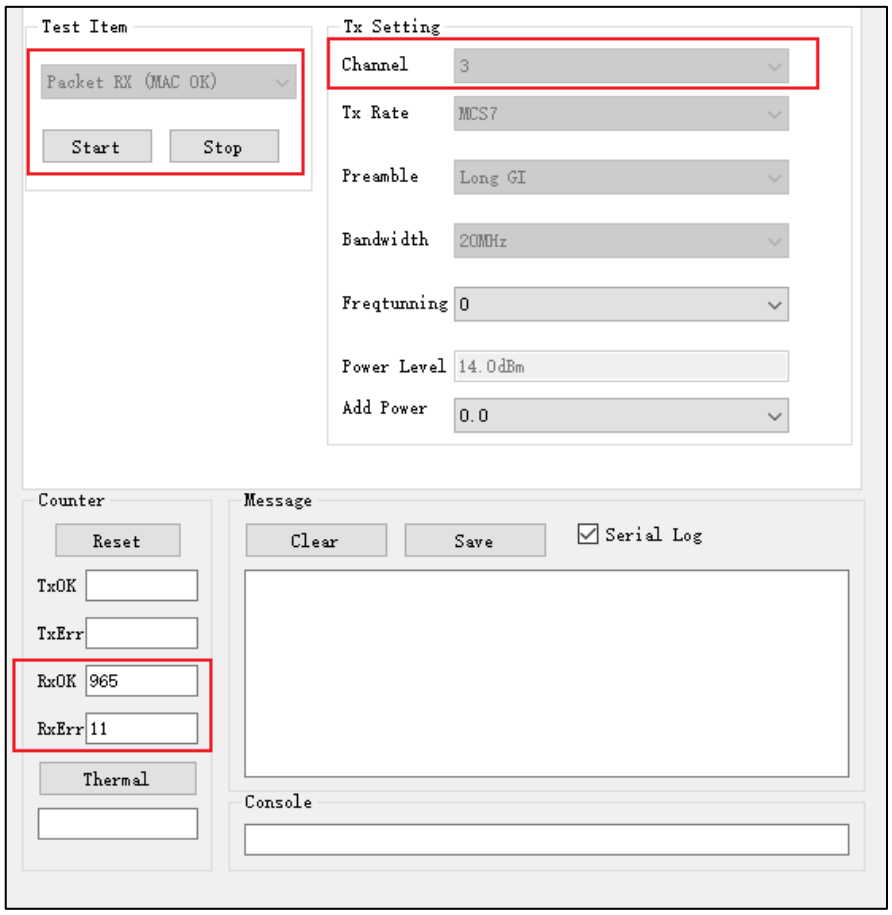
Example : RATE=1M, CHANNEL=11, the tool setting is as shown in the figure below.



2.5 Receiving test

This test item is used to test the receiving performance.

1. Set "**Test Item**" to "**Packet RX**", set "**Channel**", "**Bandwidth**".
2. Click "**Start**".



3 Wi-Fi Radio characteristics

3.1 Transmitter EIRP power characteristics

Parameter	Rate	FCC Typ	CE Typ	Unit
Tx EIRP Power	11b	20.9	18.17	dBm
	11g	18.9	18.14	
	11n, BW20M	18.9	18.11	
	11n, BW40M	15.9	17.19	

Note: PCB Antenna Gain=2.9dBi

3.2 Receiver sensitivity characteristics

Parameter	Rate	Typ	Unit
Rx Sensitivity	11b,1Mbps	-97.6	dBm
	11b,2Mbps	-94.4	
	11b,5.5Mbps	-92.1	
	11b,11Mbps	-87.6	
	11g,6Mbps	-94.3	
	11g,9Mbps	-92.5	
	11g,12Mbps	-91.0	
	11g,18Mbps	-89.1	
	11g,24Mbps	-84.6	
	11g,36Mbps	-82.4	
	11g,48Mbps	-77.0	
	11g,54Mbps	-76.3	
	11n,HT20,MCS0	-94.0	
	11n,HT20,MCS1	-90.3	
	11n,HT20,MCS2	-88.5	
	11n,HT20,MCS3	-84.4	
	11n,HT20,MCS4	-82.0	
	11n,HT20,MCS5	-76.6	
	11n,HT20,MCS6	-75.6	
	11n,HT20,MCS7	-74.2	
	11n,HT40,MCS0	-89.6	
	11n,HT40,MCS1	-85.4	

	11n,HT40,MCS2	-83.5	
	11n,HT40,MCS3	-80.3	
	11n,HT40,MCS4	-77.9	
	11n,HT40,MCS5	-72.7	
	11n,HT40,MCS6	-71.8	
	11n,HT40,MCS7	-70.7	

3.3 Rx Maximum Input Level

Parameter	Rate	Typ	Unit
Rx Maximum Level Input	11b,1Mbps	8.5	**dBm**
	11b,11Mbps	8.5	
	11g,6Mbps	8.5	
	11g,54Mbps	4.6	
	11n,HT20,MCS0	8.5	
	11n,HT20,MCS7	3.7	
	11n,HT40,MCS0	5.2	
	11n,HT40,MCS7	3.7	

3.4 Parameter conditions

Unless otherwise specified, all values given for V_{DD} = V_{DDA} = AVDD33_ANA = AVDD33_PA = AVDD33_CLK = 3.3 V, T_A = 25 ℃.

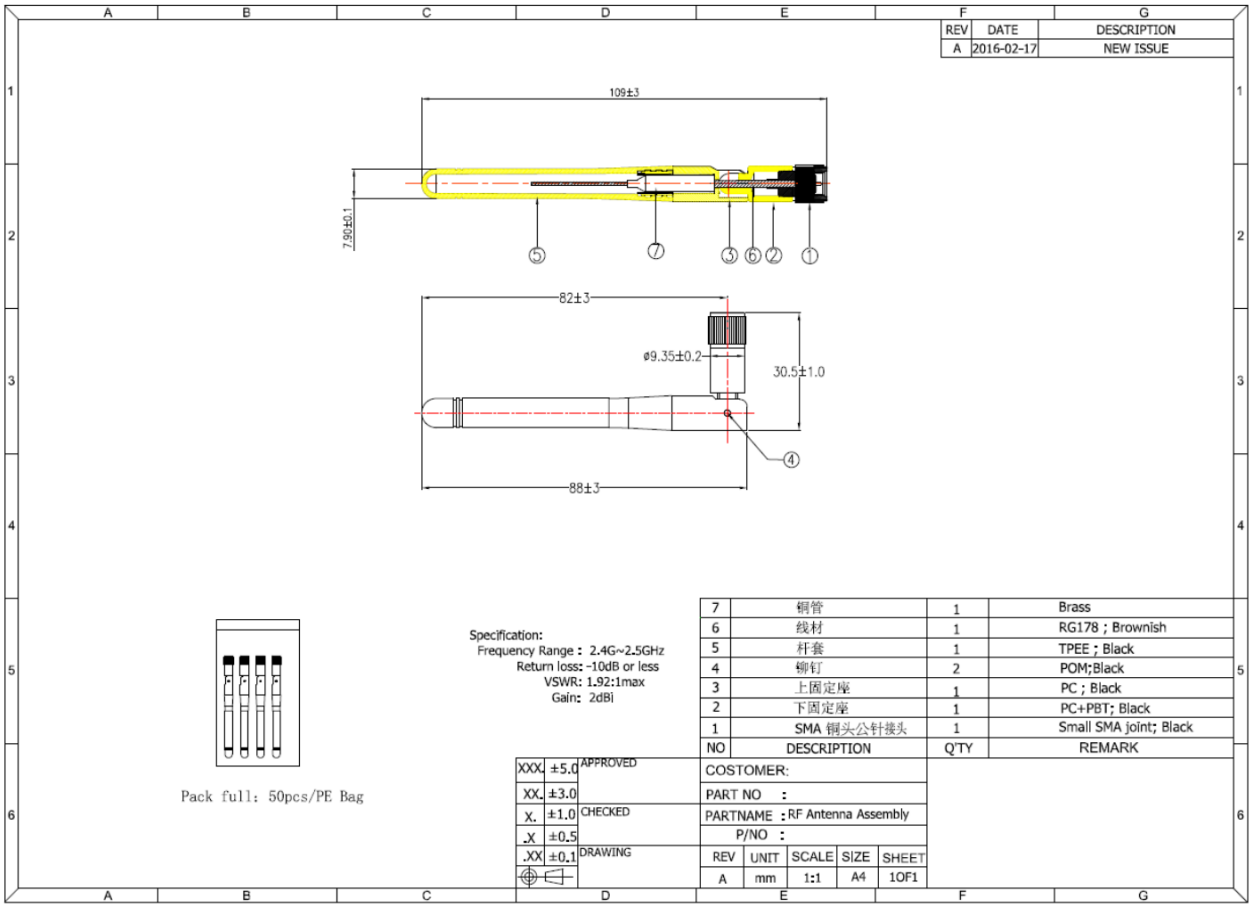
4 External antenna information

PRODUCT NAME: 2.4G -2dBi small SMA copper head male pin black antenna
Manufacturer: HUAXIN Communication

Main technical specifications	
Frequency Range(MHZ)	2400-2500
Impedance(Ω)	50
Gain(dBi)	2±0.5
VSWR	≦1.92
Admitted Power	10W
Polarization	Linear, Vertical
Radiation	Omni-directional

Connector Type	SMA
Physical Properties	
Antenna cover	TPEE
Operating Temp	-20℃~+70℃
Storage Temp	-20℃~+70℃

Specification drawing：



5 Warning

5.1 OEM/Integrators Installation Manual

Important Notice to OEM integrators

1. This module is limited to OEM installation ONLY.

2. This module is limited to installation in mobile or fixed applications, according to Part 2.1091(b).

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

4. For FCC Part 15.31 (h) and (k): The host manufacturer is responsible for additional testing to verify compliance as a composite system. When testing the host device for compliance with Part

15 Subpart B, the host manufacturer is required to show compliance with Part 15 Subpart B while the transmitter module(s) are installed and operating. The modules should be transmitting and the evaluation should confirm that the module's intentional emissions are compliant (i.e. fundamental and out of band emissions). The host manufacturer must verify that there are no additional unintentional emissions other than what is permitted in Part 15 Subpart B or emissions are complaint with the transmitter(s) rule(s).

The Grantee will provide guidance to the host manufacturer for Part 15 B requirements if needed.

Important Note

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 to XXXX 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 USI, or the host manufacturer can take responsibility through the change in FCC ID (new
application) procedure followed by a Class II permissive change application.

End Product Labeling

When the module is installed in the host device, the FCC ID label must be visible through a window on the final device or it must be visible when an access panel, door or cover is easily re-moved. If not, a second label must be placed on the outside of the final device that contains the following text: “Contains FCC ID: 2A3BS-GD32W515MD1”

The FCC ID can be used only when all FCC compliance requirements are met.

Antenna Installation

(1) The antenna must be installed such that 20 cm is maintained between the antenna and users,

(2) The transmitter module may not be co-located with any other transmitter or antenna.

(3) Only antennas of the same type and with equal or less gains as shown below may be used with this module. Other types of antennas and/or higher gain antennas may require additional authorization for operation.

Antenna type	2.4GHz band Peak Gain (dBi)		
PCB Antenna	2.9		

In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

Manual Information to the End User

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module. The end user manual shall include all required regulatory information/warning as show in this manual.

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 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 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.

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

List of applicable FCC rules

This module has been tested and found to comply with part 15.247 requirements for Modular

Approval.

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 circuity), 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.

This device is intended only for OEM integrators under the following conditions: (For module device use)

1) The antenna must be installed such that 20 cm is maintained between the antenna and users, and
2) The transmitter module may not be co-located with any other transmitter or antenna.
As long as 2 conditions above are met, further transmitter test will not be required. However, the
OEM integrator is still responsible for testing their end-product for any additional compliance
requirements required with this module installed.

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 20 cm between the radiator & your body.

5.2 RF Exposure Information for CE

The device could be used with a separation distance of 20cm to the human body.

5.3 DoC website information for CE

Hereby, GigaDevice Semiconductor Inc. declares that the radio equipment type GD32W515_MD1 is in compliance with Directive 2014/53/EU.

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