TOPBAND 拓邦

TB1206 Product specification

Revision note

Date	Version	Description
2018-12-18	V1.0	The first version

Shenzhen Topband Co., Ltd.

CONTENT

1.Overview

TB1206 is a low power consumption embedded Wi-Fi module ,developed by the Shenzhen Topband Co., ltd. It consists of a high level of integration of wireless RF chip ESP8266 and small amounts of peripheral components，With built-in wi-fi network protocol stack and rich library functions.TB1206 is embedded ultra-low power consumption of the 32-bit RISC processor，With 16 bits simple model， CPU clock speeds up to 160 MHZ，supports real-time operating system RTOS，Can use up to 80% of the capacity for application programming and development。

TB1206 integrates all wi-fi MAC and complete TCP/IP protocol function library，The user can use the module for networking function added to existing equipment，Also can build an independent network controller ，and develop Wi-Fi product embedded to satisfy his needs。

1.1 **Product features**

- ■ SOC features
  - ➢Built-in ultra-low power consumption 32-bit MCU ，The main frequency supports 80 MHZ and 160 MHZ，supports RTOS
  - ➢Built-in TCP/IP protocol stack
  - ➢Built-in 1 road 10 bits high precision ADC
- ■ Rich peripheral interfaces
  - ➢2 X UART
  - ➢1 X ADC
  - ➢1 X En
  - ➢1 X Wake up the pin
  - ➢1 X HSPI
  - ➢1 X I2C
  - ➢1 X I2S
  - ➢Most 11 X GPIOs
- ■ Wi-Fi connectivity

➢Supports 802.11 b/g/n.

➢Supports the STA/AP/STA + AP mode

➢Supports WPA/WPA2 security mechanism.

➢Supports WEP/TKIP/AES encryption type.

➢Supports the AT remote upgrade and the clouds OTA upgrade.

➢Supports SmartConfig and AP two types of Matching network (Including Android and iOS devices).

1.2 **Application field**

●Intelligent building

●Smart home

●Intelligent security

● Industrial wireless control

●The baby monitor

● Wise medical

● Wise energy

2.Electrical parameters

2.1 working conditions

Table 2-1 normal working conditions

Parameter	Minimum value	Typical value	Maximum value	Unit	Remark
Working voltage	3.0	3.3	3.6	V	
Working temperature	-20	-	85	℃	
Working humidity	10	-	90	%RH	
Storage temperature	-20	-	85	℃	
Electrostatic discharge voltage (Human body model)	-	-	2	KV	TAMB=25℃
Electrostatic discharge voltage (Machine model)	-	-	0.5	KV	TAMB=25℃

2.2 Power consumption parameters

Table2-2 power consumption parameters

Mode	Minimum value	Typical values	Maximum values	Unit
Tx802.11b，CCK 11Mbps，POUT=+17dBm	-	170	-	mA
Tx802.11g， OFDM 54 Mbps，POUT =+15dBm	-	140	-	mA
Tx802.11n，MCS7，POUT =+13dBm	-	120	-	mA
Rx 802.11b， length of the packet 1024 byte，-80dBm	-	50	-	mA
Rx 802.11g， length of the packet 1024 byte，-70dBm	-	56	-	mA

Rx 802.11n，length of the packet 1024 byte，-65dBm	-	56	-	mA
Modem-sleep①	-	15	-	mA
Light-sleep②	-	0.9	-	mA
Deep-sleep③	-	20	-	μA
Power outages	-	0.5	-	μA

Note ①: Modem-Sleep mode is used for scenes where the CPU needs to work all the time, such as applied in PWM or I2S and so on. When Wi-Fi keeps connective, and if there is no data transmission, shut down the circuit of Wi-Fi Modem to save power according to 802.11 standard (e.g U-APSD). For example, while it with DTIM3, maintain sleep for 300ms, and receive Beacon package from AP in the awake interval time for 3ms, the current consumption would be 15mA.

Note ②: Light-Sleep mode is used for applications where the CPU is intended to be paused, like switch of Wi-Fi. When Wi-Fi keeps connective, and if there is no data transmission, turn off the circuit of Wi-Fi Modem and pause CPU to save power according to 802.11 standard (e.g U-APSD). For example, while it with DTIM3, maintain sleep for 300ms, and receive Beacon package from AP in the awake interval time for 3ms, the current consumption would be 0.9mA.

Note ③: Deep-Sleep mode is used for scenes where Wi-Fi needs no to be maintained connective. It takes a long time to send data package once. For example, the sensor that measures temperature at a time per 100 second, whose whole average current consumption would be much less than 1mA when it needs 0.3s-1s to connect AP after awakening per 300 second.

3.Radio frequency characteristics

3.1 Radio frequency (rf) basic characteristics

Table 3-1 rf basic features

Parameter	Instructions	
Working frequency	2.412~2.462GHz	
Wi-Fi standard	IEEE 802.11b/g/n　(Channel 1-11)	
Data transfer rate	802.11b	1，2，5.5，11（Mbps）
	802.11g	6，9，12，18，24，36，48，54（Mbps）
	802.11n	HT20，MCS0~7

3.2 Output power

Max power<20dBm

Table 3-2 output power

Parameter	minimum value	Typical values	Maximum values	Unit
Under 72.2 Mbps，　Output power of the PA	15.5	16.5	17.5	dBm
Under 11b mode，　Output power of the PA	17.5	18.5	19.5	dBm

3.3 The adjacent channel inhibition

Table 3-3 adjacent channel inhibition

parameter	minimum value	Typical values	Maximum values	Unit
OFDM，6Mbps	-	37	-	dB
OFDM，54Mbps	-	21	-	dB
HT20，MCS0	-	37	-	dB
HT20，　MCS7	-	20	-	dB

3.4 Receiving sensitivity

able 3-4 receiving sensitivity

Parameter	Minimum	Typical	Maximum	Unit

	value	values	values	
DSSS，1Mbps	-	-98	-	dBm
CCK11，Mbps	-	-91	-	dBm
6Mbps（1/2 BPSK）	-	-93	-	dBm
54Mbps（3/4 64-QAM）	-	-75	-	dBm
HT20，MCS7（65 Mbps，72.2 Mbps）	-	-72	-	dBm

4.Module interface

4.1 Size package

   TB1206 is divided into TB1206-E and TB1206 - P two types depending on the different types of antenna， TB1206 - E size of the appearance is 18 mm (W) x 14.3 mm (L) x 3.5 mm (H)， Its appearance dimensions is as shown in figure 4-1， TB1206 -p appearance size is 18 mm (W) x 21 mm (L) x 3.5 mm (H)， Its appearance dimensions is as shown in figure 4-2。
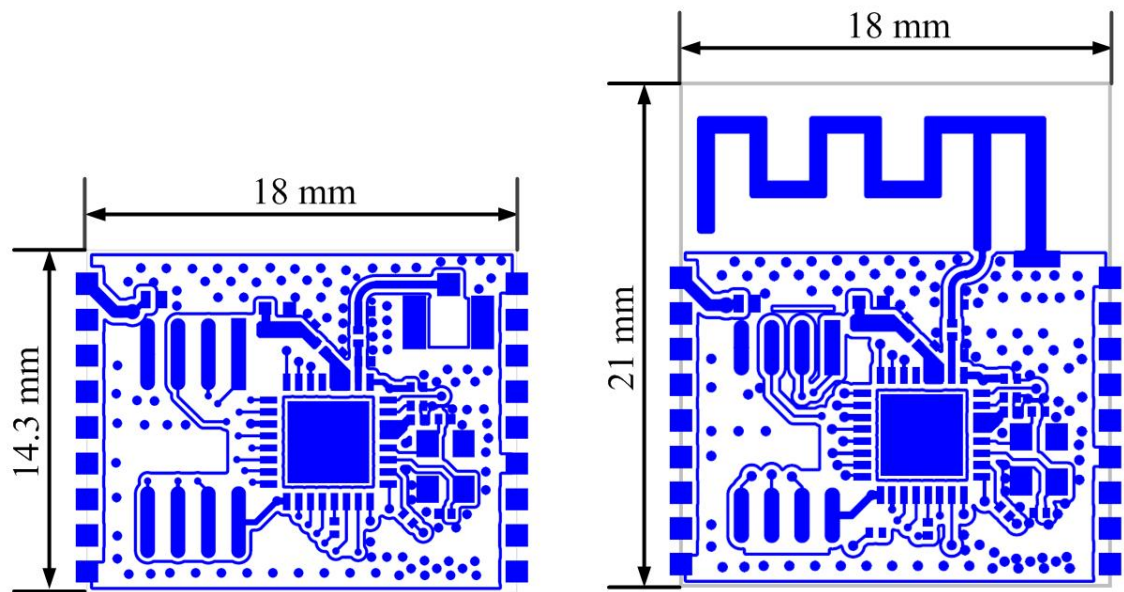
Figure 4-1 TB1206 - E appearance size figure Figure 4-2 TB1206 -p appearance size figure

4.2 Pin definition

   TB1206 pin map is as shown in figure 4-3，Pin function description table is as shown in table 4-1。

Figure 4-3 module pin map

Table 4-1 module pin function specification table

Pin	Name	type	Functional specifications
1	VCC	P	3.3 V power supply (VDD)
2	EN	I	enabled pin of outside of Chip needs to be pulled high for normal work
3	IO14	I/O	GPIO14；HSPI_CLK
4	IO12	I/O	GPIO12；HSPI_MISO
5	IO13	I/O	GPIO13；HSPI_MOSI；UART0_CTS
6	IO15	I/O	GPIO15； MTDO；HSPICS；UART0_RTS
7	IO2	I/O	GPIO2；UART1_TXD
8	IO0	I/O	GPIO0；SPI_CS2
9	GND	P	GND
10	IO4	I/O	GPIO4
11	RXD	I/O	GPIO3； Can be used as UART Rx when copying Flash content
12	TXD	I/O	GPIO1； Can be used as UART Tx when copying Flash content
13	GND	P	GND
14	IO5	I/O	GPIO5
15	RST	I	An external reset signal (effective low level)，Reset module
16	ADC	I	A/D conversion pin
17	IO16	I/O	Deep sleep wake up
18	GND	P	GND

TB1206 supports UART Downloading mode and Flash Booting mode，in different work mode，Pin is defined as shown in table 4-2。

Table 4-2 pin mode

Model	GPIO15	GPIO0	GPIO2
UART Downloading mode	Low	Low	High
Flash Boot mode	Low	High	High

5.Antenna information

5.1 Type of antenna

TB1206 -E   is for the IPX antenna specifications，TB1206 - P is for a PCB antenna specifications。

5.2 Reduce the antenna interference

When using PCB antenna on Wi-Fi module，In order to ensure the optimization of Wi-Fi performance，Suggested that   the module antenna part and other metal components at least above 16 mm distance。

User PCB don't route or has no copper in antenna area，So as not to affect the antenna performance。

6.Encapsulates information and production guidance
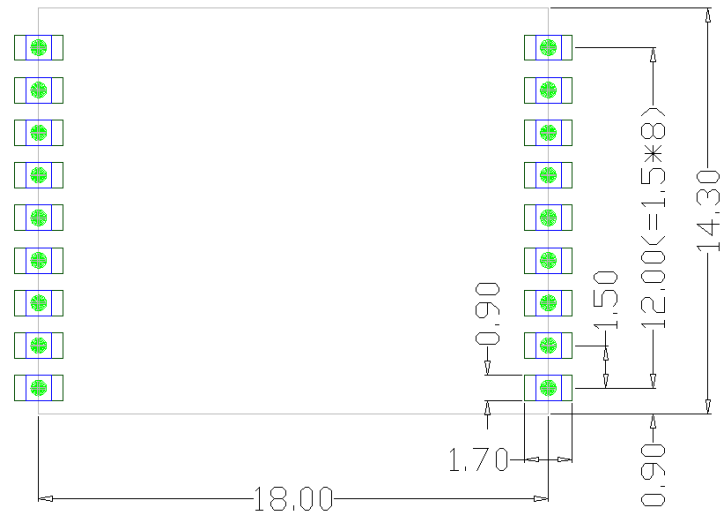
6.1 **Mechanical dimensions**

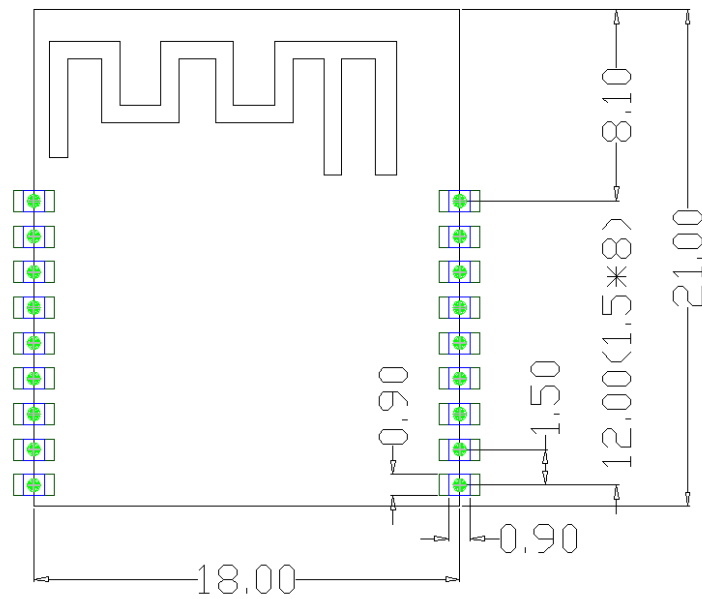Figure 6-1 TB1206 - E mechanical size chart

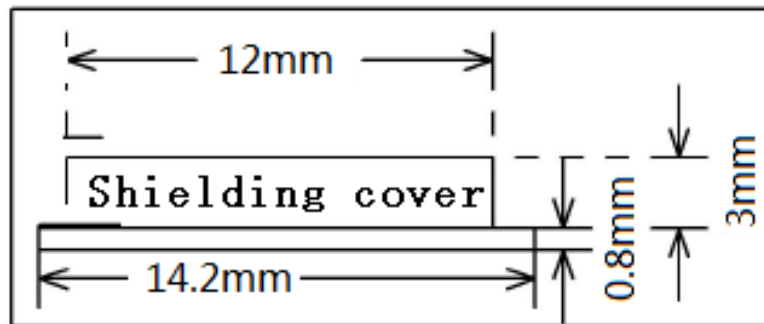Figure 6-2 TB1206 -p mechanical size chart
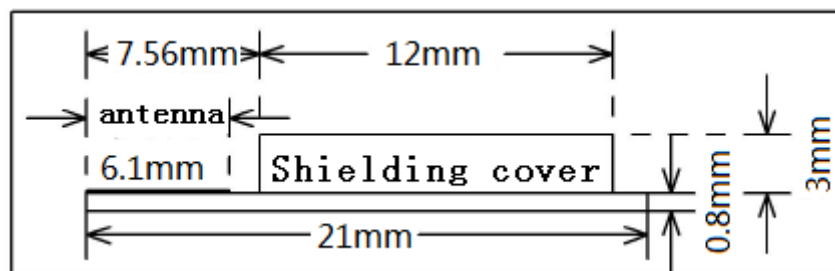
Figure 6-3 TB1206 - E side view

Figure 6-4 TB1206 - P side view

6.2 **Production guide**

Factory module storage conditions is as follow：must be SMT by SMT machine，And must finish SMT in 24 hours of open the packaging and copying firmware，Otherwise, it needs to be vacuum-packed again，baking module Before SMT。

- ■ SMT need instruments
  - ➤Reflow soldering SMT machine
  - ➤AOI monitor
  - ➤6-8 mm diameter suction nozzle
- ■ Baking need equipment
  - ➤Cabinet baking box
  - ➤Antistatic, high temperature resistant tray
  - ➤Antistatic high temperature resistant gloves
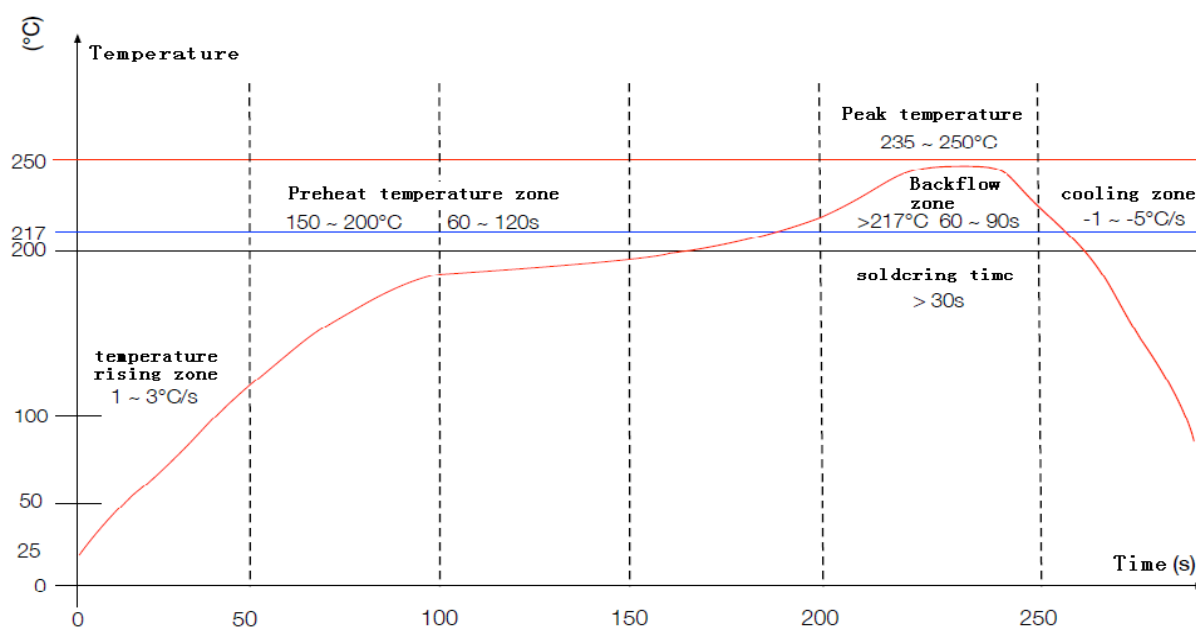
Factory module storage conditions is as follow：

- ■ Moisture bag must be stored in temperature < 30 ℃，Environment humidity < 85% RH。
- ■ Dry packaging products，The shelf life should be 6 months from the date of

packing seal。

■ In the whole process of production，Operators must wear electrostatic ring for each station。

■ When operating, prevent module from touching water or dirt。

6.3 **Reflow soldering temperature curve**

Recommend the use of lead-free soldering，Reflow soldering less than 2 times.。 Reflow soldering temperature curve are shown in figure 6-5 below.

Ramp to Reflow-temperature:25～150°C time：60～90s temperature riseing ramp rate:1～3°C/s.

Preheat temperature zone- temperature:150～200°C time：60-120s.

Reflow soldering area-temperature: greater than217°C time：60-90s; Peak temperature：235～250°C time：30～70s.

cooling zone- temperature: Peak temperature～180°C, temperature Cooling down ramp rate:-1～-5 °C/s.

solder-tin silver copper alloy Lead-free solder (SAC305)

Figure 6-5 reflow soldering temperature curve

6.4 **Peripheral wiring advice**

The TB1206 integrates high-speed GPIO and peripheral interfaces，This can cause severe switching noise。If some applications require higher power consumption

and EMI characteristics，It is recommended to connect resistance of 10~100 ohms in series on digital I/O line。This prevents too much impact when switching the power supply，and make the signal smooth，It also prevents the release of static electricity (ESD) to a certain extent.

Appendix - design information

■ Espressif ESP8266 resources

➤ ESP8266 quick start guide.

➤ ESP8266 SDK start guide.

➤ ESP8266 SDK.

➤ ESP8266 download tool.

➤ ESP8266 official BBS.

➤ ESP8266 resources collection.

FCC Compliance

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.

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

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 ina 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 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: 2ADDWTB1206. The host system using this module, should have label in a visible area indicated the following texts: "Contains FCC ID: 2ADDWTB1206".

The host will Satisfy Class I or Class Ⅱ permissive change based this module FCC ID

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, specifically for master devices in 5 GHz DFS bands.

Explanation: The EUT has a PCB Antenna, , and the antenna use a permanently attached antenna which is not replaceable.

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 not a limited 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: Yes, The module with trace antenna designs, and This manual has been shown the layout of trace design,, antenna, connectors, and isolation requirements.

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 is: 2ADDWTB1206.

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 has a PCB Antenna, , and the antenna use a permanently attached antenna which is unique.

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: 2ADDWTB1206.

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: Topband 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 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.

Explanation: The module without unintentional-radiator digital circuity, so the module does not require an evaluation by FCC Part 15 Subpart B. The host shoule be evaluated by the FCC Subpart B.