BB1735_46P_RTL
Bluetooth Module

1 Device Overview

1.1 Features

- Ultra-low consumption with intelligent PMU
- Supports Bluetooth 5 core specification
- Supports 2Mbps LE
- LE advertising Extensions
- LE Long Range
- Additional Adv channel
- High Duty Cycle Non-Connectable Adv
- Supports multiple level Low Energy states
- Supports LE L2CAP Connection Oriented Channel Support
- Supports GAP,ATT/GATT,SMP,L2CAP
- Supports LE low duty directed advertising
- Supports LE data length extension feature
- Support OTA programming mechanism for firmware upgrade

1.2 Applications

- Mesh LED
- Mice and wireless keyboard
- Game controllers & joysticks
- Voice remote controls
- Home automation
- Sensor network devices
- Amazon gadgets
- Intelligent Lighting/appliances

1.3 Description

The Module is designed base on the Realtek RTL8762CMF that is an ultra-low power system on-chip solution for Bluetooth 5.0 low energy applications.

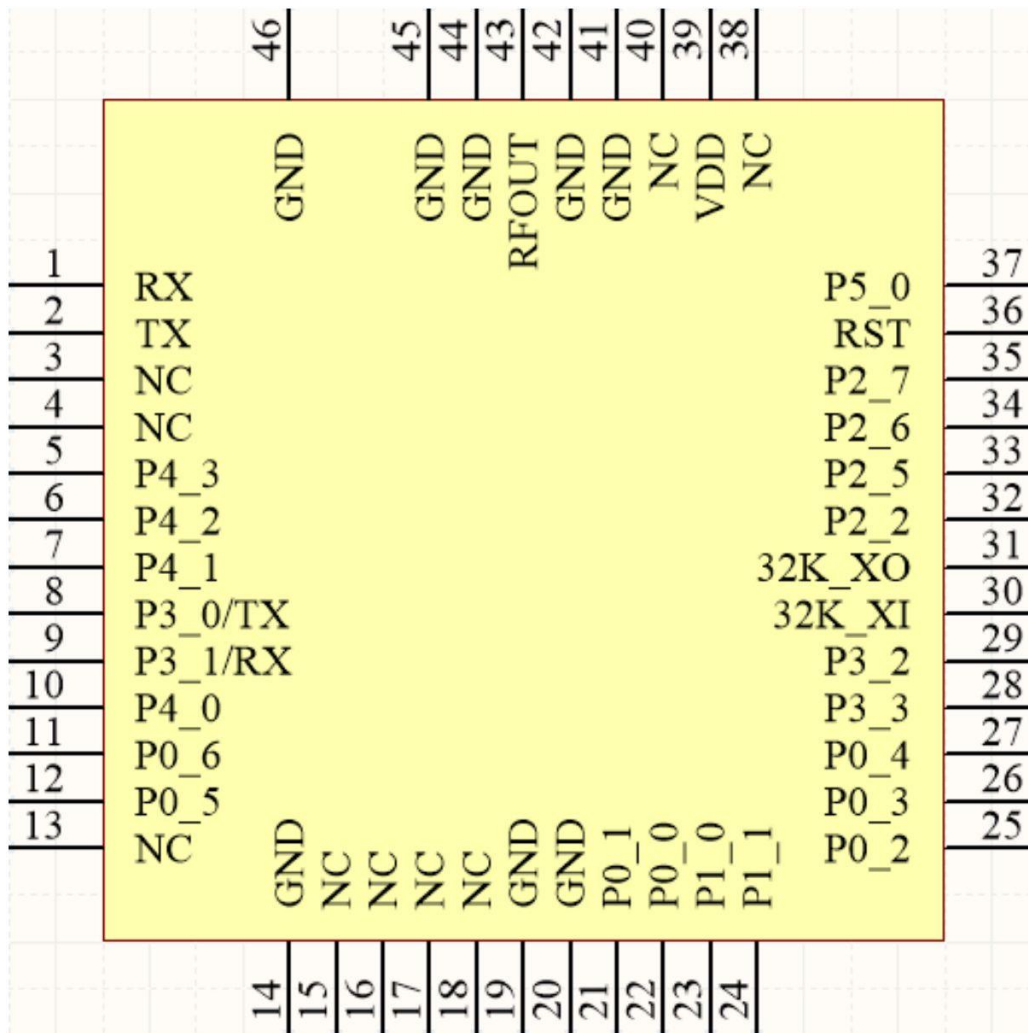## 2 Pin Configuration and Functions

2.1 Module Pin Diagram

Figure 2. Pin Diagram of
BB1735_46P_RTL

2.2 Pin Functions

NO.	Name	Pin	Type	Description
1	RX/P3_1	1,9	IO	HCI UART_RX(Default)
2	TX/P3_0	2,8	IO	HCI UART_TX(Default)
3	NC	3,4,13,15,16, 17,18,38,40	NC	NC
4	P4_3	5	IO	General purpose IO 8mA driving capability With wakeup function With inter strong/weak pull-up and pull-down
5	P4_2	6	IO	General purpose IO 8mA driving capability With wakeup function With inter strong/weak pull-up and pull-down
6	P4_1	7	IO	General purpose IO 8mA driving capability With wakeup function With inter strong/weak pull-up and pull-down
7	P4_0	10	IO	General purpose IO 8mA driving capability With wakeup function With inter strong/weak pull-up and pull-down
8	P0_6	11	IO	General purpose IO 8mA driving capability With wakeup function With inter strong/weak pull-up and pull-down
9	P0_5	12	IO	General purpose IO 8mA driving capability With wakeup function With inter strong/weak pull-up and pull-down
10	GND	14,19,20,41, 42,44,45,46	GROUND	GROUND
11	P0_1	21	IO	General purpose IO 8mA driving capability With wakeup function With inter strong/weak pull-up and pull-down

12	P0_0	22	IO	General purpose IO 8mA driving capability With wakeup function With inter strong/weak pull-up and pull-down
13	P1_0	23	IO	General purpose IO 8mA driving capability With wakeup function With inter strong/weak pull-up and pull-down SWDIO(default)
14	P1_1	24	IO	General purpose IO 8mA driving capability With wakeup function With inter strong/weak pull-up and pull-down SWDCLK(default)
15	P0_2	25	IO	General purpose IO 8mA driving capability With wakeup function With inter strong/weak pull-up and pull-down
16	P0_3	26	IO	LOG_UART TX. Power on trap: Pull-up for normal operation Pull-down to bypass executing program code in flash (PAD internal pull-up by default).
17	P0_4	27	IO	General purpose IO 8mA driving capability With wakeup function With inter strong/weak pull-up and pull-down
18	P3_3	28	IO	General purpose IO 8mA driving capability With wakeup function With inter strong/weak pull-up and pull-down
19	P3_2	29	IO	General purpose IO 8mA driving capability With wakeup function With inter strong/weak pull-up and pull-down
20	32K_XI	30	A/IO	32k crystal input or external 32k clock input (optional) Pin share as GPIO when external 32k is not used.
21	32K_XO	31	A/IO	32k crystal input or external 32k clock output (optional) Pin share as GPIO when external 32k is not used.

22	P2_2	32	A/IO	General purpose IO 8mA driving capability With wakeup function With inter strong/weak pull-up and pull-down AUXADC input 2
23	P2_5	33	A/IO	General purpose IO 8mA driving capability With wakeup function With inter strong/weak pull-up and pull-down AUXADC input 5
24	P2_6	34	A/IO	General purpose IO 8mA driving capability With wakeup function With inter strong/weak pull-up and pull-down AUXADC input 6
25	P2_7	35	A/IO	General purpose IO 8mA driving capability With wakeup function With inter strong/weak pull-up and pull-down AUXADC input 7
26	RST	36	I	Hardware reset pin,low active
27	P5_0	37	IO	General purpose IO; 8mA driving capability With wakeup function With inter strong/weak pull-up and pull-down
28	VDD	39	Power Supply	Supply 1.8V~3.3V
29	RFOUT	43	ANT	2.4G ANT interface

Table 1. Pin Attributes of
BB1735_46P_RTL

Note:With the exception of the VDD/GND/TX/RX/ANT pin, the other pins are for the subsequent whole machine end design

All GPINote:Pin Multiplexer

All GPIO pins are configurable via the built-in pin multiplexer(PINMUX), The table shows all GPIO pin configurations.All pins have an internal pull-up pull-down resistor for controlling GPIO_PU and GPIO_PD.O pins are configurable via the built-in pin multiplexer(PINMUX), The table shows all GPIO pin configurations.All pins have an internal pull-up pull-down resistor for controlling GPIO_PU and GPIO_PD.

Pin Multiplexer Table

0	IDEL	25	qdec_phase_a_z	50	SPI0_CLK (master only)	75	KEY_COL_17	100	Reserved	125	Reserved
1	HCI_UART_TX	26	qdec_phase_b_z	51	SPI0_MO (master only)	76	KEY_COL_18	101	Reserved	126	Reserved
2	HCI_UART_RX	27	UART2_TX	52	SPI0_MI (master only)	77	KEY_COL_19	102	PDM (clk)	127	MCLK
3	HCI_UART_CTS	28	UART2_RX	53	SPI2W_DATA (master only)	78	KEY_ROW_0	103	PDM (data)		
4	HCI_UART_RTS	29	UART1_TX	54	SPI2W_CLK (master only)	79	KEY_ROW_1	104	UART2_CTS		
5	I2C0_CLK	30	UART1_RX	55	SPI2W_CS (master only)	80	KEY_ROW_2	105	UART2_RTS		
6	I2C0_DAT	31	UART1_CTS	56	SWD_CLK	81	KEY_ROW_3	106	Reserved		
7	I2C1_CLK	32	UART1_RTS	57	SWD_DIO	82	KEY_ROW_4	107	Reserved		
8	I2C1_DAT	33	IRDA_TX	58	KEY_COL_0	83	KEY_ROW_5	108	Reserved		
9	PWM2_P	34	IRDA_RX	59	KEY_COL_1	84	KEY_ROW_6	109	Reserved		
10	PWM2_N	35	UART0_TX	60	KEY_COL_2	85	KEY_ROW_7	110	Reserved		
11	PWM3_P	36	UART0_RX	61	KEY_COL_3	86	KEY_ROW_8	111	Reserved		
12	PWM3_N	37	UART0_CTS	62	KEY_COL_4	87	KEY_ROW_9	112	Reserved		
13	PWM0	38	UART0_RTS	63	KEY_COL_5	88	KEY_ROW_10	113	Reserved		
14	PWM1	39	SPI1_SS_N_0 (master only)	64	KEY_COL_6	89	KEY_ROW_11	114	Reserved		
15	PWM2	40	SPI1_SS_N_1 (master only)	65	KEY_COL_7	90	DWGPIO	115	Reserved		
16	PWM3	41	SPI1_SS_N_2 (master only)	66	KEY_COL_8	91	I2S_LRCLK	116	Reserved		
17	PWM4	42	SPI1_CLK (master only)	67	KEY_COL_9	92	I2S_BCLK	117	EN_EXPA		
18	PWM5	43	SPI1_MO (master only)	68	KEY_COL_10	93	I2S_ADCDAT	118	EN_EXLNA		
19	PWM6	44	SPI1_MI (master only)	69	KEY_COL_11	94	I2S_DACDAT	119	ANT_SW0		
20	PWM7	45	SPI0_SS_N_0 (slave)	70	KEY_COL_12	95	Reserved	120	ANT_SW1		
21	qdec_phase_a_x	46	SPI0_CLK (slave)	71	KEY_COL_13	96	DMIC1_CLK	121	ANT_SW2		
22	qdec_phase_b_x	47	SPI0_SO (slave)	72	KEY_COL_14	97	DMIC1_DAT	122	ANT_SW3		
23	qdec_phase_a_y	48	SPI0_SI (slave)	73	KEY_COL_15	98	Reserved	123	Reserved		
24	qdec_phase_b_y	49	SPI0_SS_N_0 (master only)	74	KEY_COL_16	99	Reserved	124	Reserved		

3 Specifications

3.1 Absolute Maximum Rating

1) Power supply voltage :

   VDD:1.8V~3.3V

2) Operation temperature range： -20℃~+50℃

3) Storage temperature range： -40℃~+105℃

3.2 Power Consumption:

Active Mode/Condition:VDD=3.3V,ambient temperature:25℃

Power Mode	Current Consumption(Typical)
Active RX mode	7.5mA
Active TX mode(TX power:0dBm)	20.5mA

3.3 RF Characteristics

1) Receiver RF Specifications

Parameter	Condition	Min.	Typ.	Max.
Frequency Range(MHz)		2402		2480
Sensitivity(dBm)	PER≤30.8%		-90	
Maximum Input Level(dBm)	PER≤30.8%			+20
C/I	C/Ico-channel(dB)	21		
	C/I+1MHz(dB)	15		
	C/I-1MHz(dB)	15		
	C/I+2MHz(dB)	-17		
	C/I-2MHz(dB)	-15		
	C/I+3MHz(dB)	-27		
	C/IImage(dB)	-9		
	C/IImage+1MHz(dB)	-15		
	C/IImage-1MHz(dB)	-15		
Blocker Power(dBm)	30~2000MHz, Wanted signal level=-67dBm	-30		
	2003~2399MHz, Wanted signal level=-67dBm	-35		
	2484~2997MHz, Wanted signal level=-67dBm	-35		
	3000MHz~12.75GHz, Wanted signal level=-67dBm	-30		
Max PER Report Integrity	Wanted signal:-30dBm		50%	
Max Intermodulation level (dBm)	Wanted signal(f0):-64dBm Worst intermodulation level@2f1-f2=f0, |f1-f2|=nMHz,n=3,4,5…	-50		

Note1：Does not include spur channel

Note2：Depends on PCB design and registers setting

Transmitter RF Specifications

Parameter	Condition	Min.	Typ.	Max.
Frequency Range(MHz)	-	-	-8	8
Maximum Output Power			5.5dBm	5.86dBm
Adjacent Channel Power Ratio (dBm)	+2MHz	-		-20
	-2MHz	-	-	-20
	≥+3MHz	-	-	-30
	≤-3MHz	-	-	-30
Modulation Characteristics	$\triangle$ f1avg(kHz)	-	250	-
	$\triangle$ f2max(kHz)	185	-	-
	$\triangle$ f2max	-	100	-
	$\triangle$ f2maxPassRate(%)	-	0.88	-
Carrier Frequency Offset and Drift	Average Fn(kHz)	-	12.5	-
	Drift Rate(kHz/50us)	-	10	-
	Avg Rate(kHz/50us)	-	10	-
	Max Rate(kHz/50us)	-	10	-
Output power of second harmonic(dBm)	-	-	-50 （note）	-
Output power of third harmonic(dBm)	-	-	-50 （note）	-

Note：Tested by EVB with RF PI network.

4 Thermal Reflow

Referred to IPC/JEDEC standard.
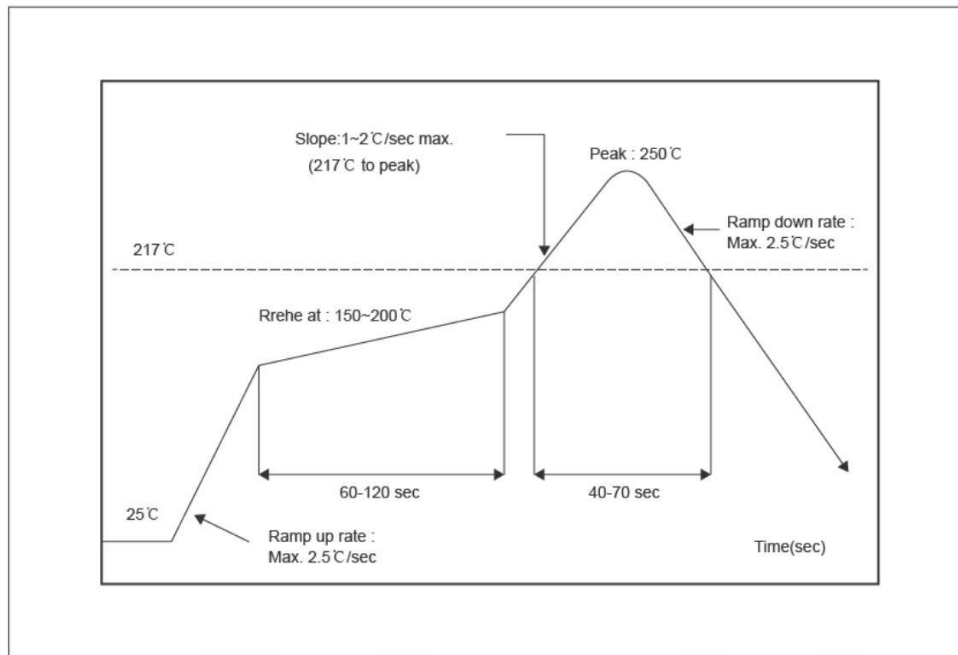
Peak temperature: <250°C

Reflow :less than 2 times

Figure 9. Recommended Reflow for Lead Free Solder

Note: The module is not recommanded to go through reflow Oven twice.

7 Revision History

Date	Version No.	Description	Author
2021.04.12	V0.1	Initial version	Vin
2021.04.21	V0.2	Add RF data	Vin
2021.07.08	V1.0	Update the picture and the power consumption	Vin

IC Information

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions:

(1) this device may not cause interference, and

(2) this device must accept any interference, including interference that may cause undesired operation of the device.

Cet appareil est conforme avec Industrie Canada exempts de licence standard RSS (s). L'opération est soumise aux deux conditions suivantes:

(1) cet appareil ne peut causer d'interférences, et

(2) cet appareil doit accepter toute interférence, y compris les interférences qui peuvent causer un mauvais fonctionnement de l'appareil.

The end product must be labeled to display the Industry Canada certification number of the module.

Contains transmitter module IC: 28850-AAIC1

Le dispositif d'accueil doivent être étiquetés pour afficher le numéro de certification d'Industrie Canada du module.

Contient module émetteur IC: 28850-AAIC1

Information for OEM Integrator

This device is intended only for OEM integrators under the following conditions:

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.

End product labelling

The label for end product must include "Contains IC: 28850-AAIC1".

"CAUTION: Exposure to Radio Frequency Radiation.

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance of 20cm between the radiator and your body. This transmitter module is authorized only for use in device where the antenna may be installed such that 20 cm may be maintained between the antenna and users."

The Host Marketing Name (HMN) must be indicated at any location on the exterior of the host product or product packaging or product literature, which shall be available with the host product or online.

This radio transmitter [lC: 28850-AAIC1] has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

Frequency range	Manufacturer	Peak gain	Impedance	Antenna type
2400-2483.5MHz	Aputure Imaging Industries Co., Ltd .	0.86 dBi	50Ω	PCB Antenna

FCC MODULAR APPROVAL INFORMATION EXAMPLES for Manual
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.
(2) This device must accept any interference received, including interference that may cause undesired operation.

CAUTION: Changes or modifications 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 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.

FCC 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 20cm between the radiator & your body.

OEM INTEGRATION INSTRUCTIONS:

This device is intended only for OEM integrators under the following conditions:

The module must be installed in the host equipment such that 20 cm is maintained between the antenna and users, and the transmitter module may not be co-located with any other transmitter or antenna. The module shall be only used with the internal on-board antenna that has been originally tested and certified with this module. External antennas are not supported. As long as these 3 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 (for example, digital device emissions, PC peripheral requirements, etc.). The end-product may need Verification testing, Declaration of Conformity testing, a Permissive Class II Change or new Certification. Please involve a FCC certification specialist in order to determine what will be exactly applicable for the end-product.

Validity of using the module certification:

In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization for this module in combination with the host equipment is no longer considered valid and the FCC ID of the module 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. In such cases, please involve a FCC certification specialist in order to determine if a Permissive Class II Change or new Certification is required.

Upgrade Firmware:

The software provided for firmware upgrade will not be capable to affect any RF parameters as certified for the FCC for this module, in order to prevent compliance issues.

End product labeling:

This transmitter module is authorized only for use in device where the antenna may be installed such that 20 cm may be maintained between the antenna and users. The final end product must be labeled in a visible area with the following: "Contains FCC ID: 2AABZ-BJ1028D ".

Information that must be placed in the end user manual:

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.

"CAUTION : Exposure to Radio Frequency Radiation.
Antenna shall be mounted in such a manner to minimize the potential for human contact during normal operation. The antenna should not be contacted during operation to avoid the possibility of exceeding the FCC radio frequency exposure limit.

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: 2AABZ-BJ1028D.

Frequency range	Manufacturer	Peak gain	Impedance	Antenna type
2400-2483.5MHz	Aputure Imaging Industries Co., Ltd .	0.86 dBi	50Ω	PCB Antenna

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: 2AABZ-BJ1028D, Contains IC: 28850-AAIC1"

2.9 Information on test modes and additional testing requirements5

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: Top band 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.