BTA3X Specification

➢ Document History

Version	Date	Person	Remarks
V0.1	2021-03-08	KEN	Draft version
V0.2	2021-05-25	KEN	Modified the following items - 3. Module Pin Description - 4. Module Size - operating temperature and storge temperature - 7. RF Characteristics - 8.2 Module Placement Guidelines
V0.3	2021-10-08	KEN	Modified operating temperature in 6.2
V0.4	2021-12-29	KEN	Added 6.3 part
V0.5	2022-01-18	KEN	Modified the description in 6.3 part Added module label specification in 11 part
V0.6	2022-04-02	KEN	Updated the following items - Added descriptions in 1. Product Overview - Added profile version in 2. Product Features - Added size and weight in 4. Module Size - Added remark information in 6.2 - Added 6.4 Operation Frequency - Added 6.5 Power Consumption - Added 7.1 Radio Transceiver - Updated 9. Handling Precautions - Added 12. Certification

➢ Directory

➢ 1. Product Overview

The purpose of the Specification is to provide the design, manufacture and other related technical information for BTA3X Bluetooth module.

1.1 Product Description

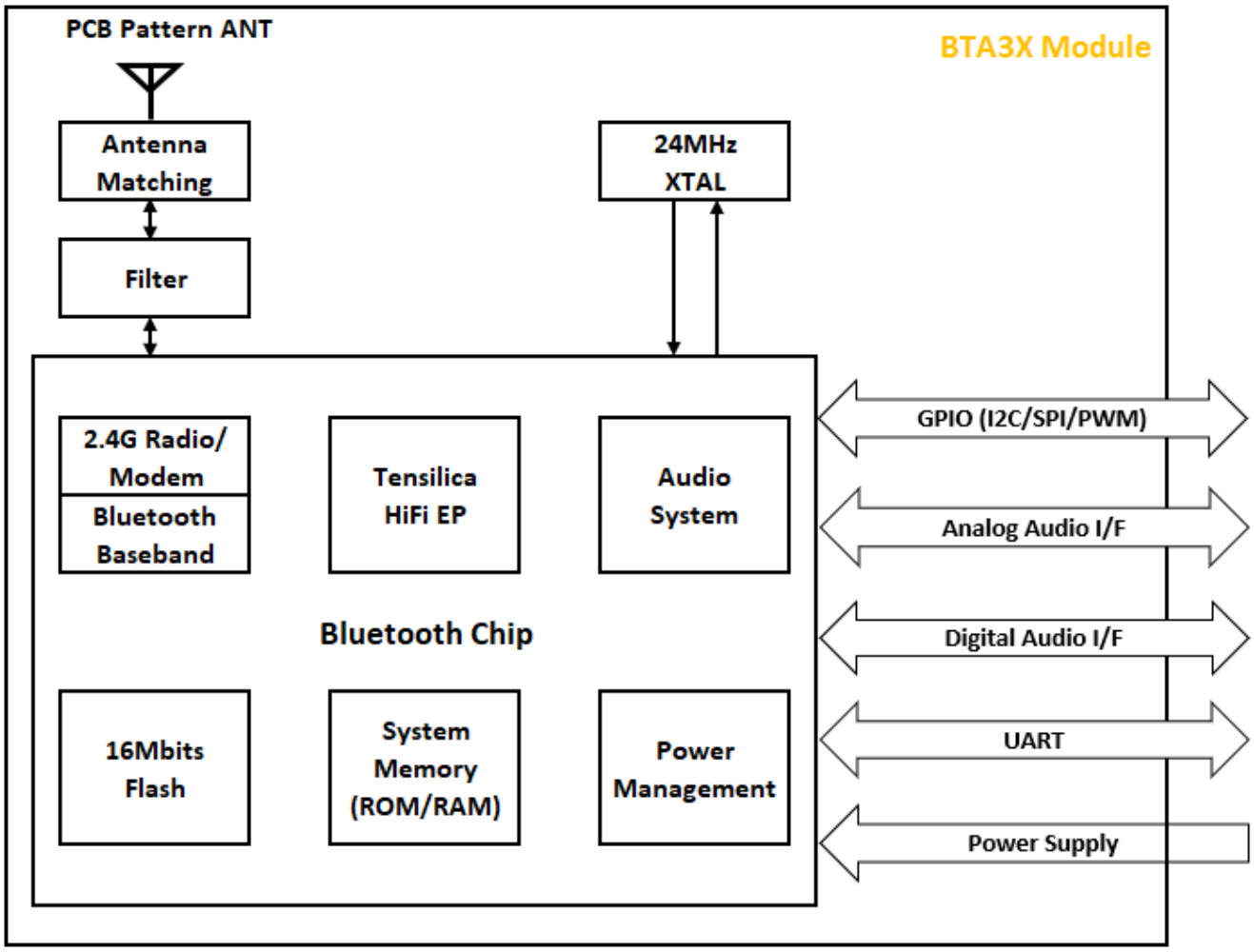
BTA3X is a stereo audio module solution that support Bluetooth 5.2 dual mode. It is designed and developed by USE Technology (Shenzhen) Co., Ltd. and produced at SUNITEC ELECTRONICS TECHNOLOGY LTD in China.

BTA3X provides premium audio performance, crystal voice and advanced music quality in most of the Bluetooth audio speaker and headset applications.

BTA3X is designed as stamp hole package type for easy placement. It has 52 stamp pins. It is RoHS compliance, has also obtained Bluetooth certification and radio certification of some countries or regions.

➢ 2. Product Features

The BTA3X integrates a wireless Bluetooth chip. It has a high-performance stereo audio codec that can be used to receive audio data wirelessly from Bluetooth source device, like smart phone or PC and output to it via analog or digital audio interface. It also transfers BLE data between apps and the model that adopts BTA3X.



BTA3X Diagram Block

Main Features：

[Platform]

- Tensilica HiFi EP processor
- Embedded 16Mbits Flash
- Support iOS and Android Apps
- Integrated Li-ion battery charge supports over-discharging protection
- Integrated 1.35V/1.8V buck and 3V/1.2V LDO regulator

[Bluetooth and Audio]

- Bluetooth Spec version 5.2 fully qualified.
- Bluetooth Profile: A2DP, AVRCP, HFP, HSP, SPP, BLE MIDI, GAP, GATT

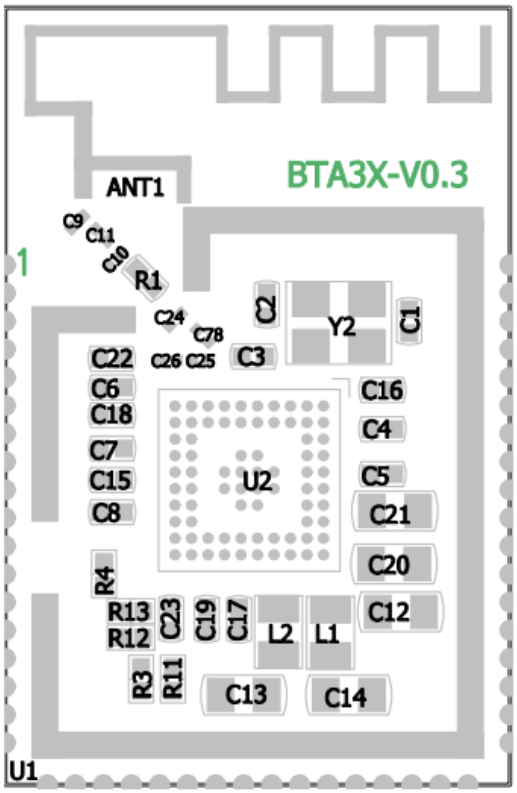
  A2DP profile version: 1.3.2 compliant
  AVRCP profile version: 1.6.2 compliant
  HFP profile version: 1.8 compliant
  HSP profile version: 1.2 compliant
  SPP profile version: 1.2 compliant
  GAP, GATT: core spec 5.2 compliant
- Audio Codec: SBC, AAC
- Multiband Programmable EQ and Dynamic range control
- Noise reduction and echo cancellation
- Wideband speech, wideband voice prompt and customized voice prompt
- Class 2 type Output Power: +2dBm

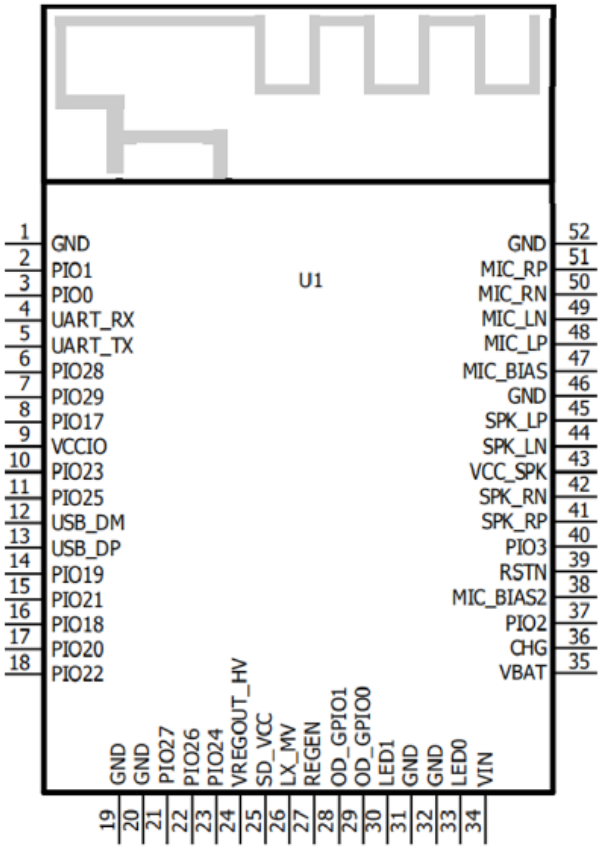
[Connectivity]

- UART, I2C, I2S, AMIC and IMIC

➢ 3. Module Pin Description

As the following figure shown, BTA3X has 52 stamp pins. Each pin number, pin type and supply is listed in the following table.





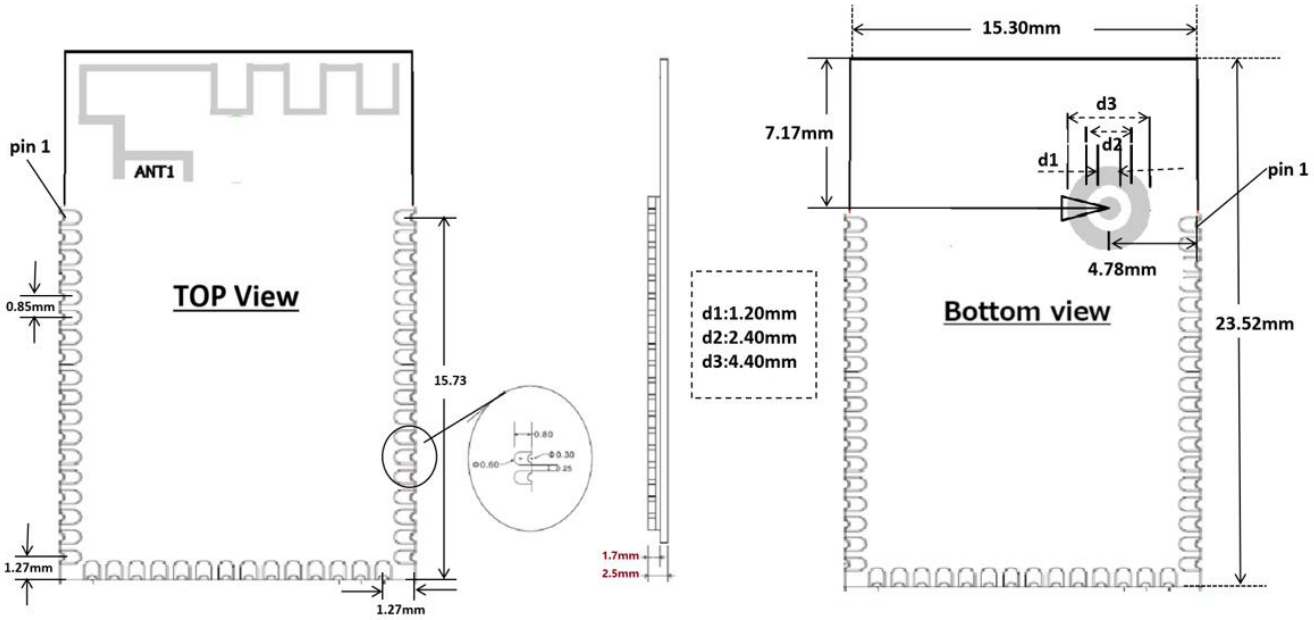
#Pin	Net Name	Pin Type	Supply Domain	Description	Alternative
1	GND	Ground	Substrate Ground		
2	PIO1	Input/Output, Digital	VCCIO	Programmable IO	AIO
3	PIO0	Input/Output, Digital	VCCIO	Programmable IO	AIO
4	UART_RX	Input only, Digital	VCCIO	UART RX (Programming/Log output)	
5	UART_TX	Output only Digital	VCCIO	UART TX (Programming/Log output)	
6	PIO28	Input/Output, Digital	VCCIO	Programmable IO	AIO
7	PIO29	Input/Output, Digital	VCCIO	Programmable IO	AIO
8	PIO17	Input/Output, Digital	VCCIO	Programmable IO	AIO
9	VCCIO	Supply, 1.55 – 3.3V	-	Power supply for GPIO	

10	PIO23	Input/Output, Digital	VCCIO	Programmable IO	
11	PIO25	Input/Output, Digital	VCCIO	Programmable IO	
12	USB_DM	Analog	VCCUSB	USB data minus	
13	USB_DP	Analog	VCCUSB	USB data plus	
14	PIO19	Input/Output, Digital	VCCIO	Programmable IO	
15	PIO21	Input/Output, Digital	VCCIO	Programmable IO	
16	PIO18	Input/Output, Digital	VCCIO	Programmable IO	
17	PIO20	Input/Output, Digital	VCCIO	Programmable IO	
18	PIO22	Input/Output, Digital	VCCIO	Programmable IO	
19	GND	Ground	Substrate Ground	-	
20	GND	Ground	Substrate Ground	-	
21	PIO27	Input/Output, Digital	VCCIO	Programmable IO	
22	PIO26	Input/Output, Digital	VCCIO	Programmable IO	
23	PIO24	Input/Output, Digital	VCCIO	Programmable IO	
24	VREGOUT_HV	Analog	-	LDO output, HV power	
25	SD_VCC	Supply, 3V	-	Supply eMMC power	
26	LX_MV	Analog	-	Switching regulator output	
27	REGEN	Input, Digital	-	Regulator enable, Internal 100K pull low	VBAT domain
28	OD_GPIO1	Input/Output, Digital	VCCIO	Programmable IO	
29	OD_GPIO0	Input/Output, Digital	VCCIO	Programmable IO	
30	LED1	Output only, Open Drain	VCCIO	LED driver 1	
31	GND	Ground	Substrate Ground	-	
32	GND	Ground	Substrate Ground	-	
33	LED0	Output only, Open Drain	VCCIO	LED driver 0	
34	VIN	Supply	-	Switching/Linear regulator input	
35	VBAT	Supply	-	System power, Charger output for battery	
36	CHG	Supply, 5V	-	Power for charger	

37	PIO2	Input/Output, Digital	VCCIO	Programmable IO	AIO
38	MIC_BIAS2	Analog	HV_MIC	Microphone bias 2	
39	RSTN	Input, Digital	-	Global reset, active low Internal 15K pull up	VCCIO domain
40	PIO3	Input/Output, Digital	VCCIO	Programmable IO	AIO
41	SPK_RP	Analog	VCCSPK	Speaker output RP	
42	SPK_RN	Analog	VCCSPK	Speaker output RN	
43	VCC_SPK	Supply, 1.6V/3V	-	Power supply for audio speaker	
44	SPK_LN	Analog	VCCSPK	Speaker output LN	
45	SPK_LP	Analog	VCCSPK	Speaker output LP	
46	GND	Ground	Substrate Ground	-	
47	MIC_BIAS	Analog	HV_MIC	Microphone bias	
48	MIC_LP	Analog	VCCXO	Microphone LP path	
49	MIC_LN	Analog	VCCXO	Microphone LN path	
50	MIC_RN	Analog	VCCXO	Microphone RN path	
51	MIC_RP	Analog	VCCXO	Microphone RP path	
52	GND	Ground	Substrate Ground	-	

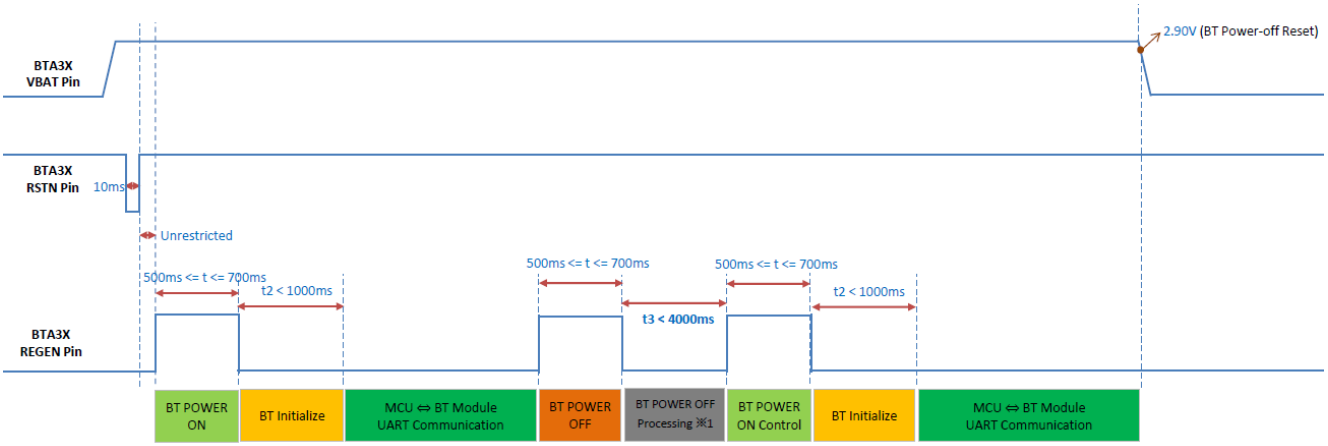
➢ 4. Module Size

For BTA3X, a 23.52 x 15.30 x 2.50mm, 0.85mm pitch, stamp pin package is offered. The weight of BTA3X module is about 1.3 grams. The package view and size information are shown in following figure.



➢ 5. Power On/Off Sequence

The power on/off control method is shown in following timing chart.



※If want to power on BTA3X again after power off via REGEN port control while maintaining VBAT, please wait 4 seconds before controlling REGEN port.

➢ 6. Electrical Characteristics

6.1 Absolute maximum ratings

Description	Min.	Max.	Unit
VCCIO: I/O supply voltage	-0.30	3.60	V
VBAT: System power, Charger output	-0.30	4.80	V
REGEN: Regulator enable	-0.30	4.80	V
VIN: Switching Regulator supply voltage	-0.30	4.80	V
CHG: Charger supply voltage	-0.30	6.50	V
VCCSPK	-0.30	3.60	V
Operating temperature	-20	+70	℃
Storage temperature	-25	+85	℃

6.2 Operating conditions

Description	Min.	Typ.	Max.	Unit
VCCIO: I/O supply voltage	1.55	1.60	3.60	V
VBAT: System power, Charger output(※)	2.70	3.70	4.80	V
VIN: Switching Regulator supply voltage	2.70	3.70	4.80	V
CHG: Charger supply voltage	4.50	5.00	6.50	V
VCCSPK	1.55	1.60	3.30	V
Operating temperature	-20	+25	+70	℃

※The capability value of VBAT is 2.7V to 4.8V, but it is designed to power off at 2.9V depending on the firmware now.

6.3 Digital terminals

Description	Min.	Typ.	Max.	Unit
INPUT VOLTAGE LEVELS				
Input logic level low (V_{IL})	-0.7	-	0.3*VCCIO	V
Input logic level high (V_{IH})	0.7*VCCIO	-	4.0	V
OUTPUT VOLTAGE LEVELS (1.7V≤VCCIO≤1.9V)				
Output logic level low (V_{oL})	-	-	0.2	V
Output logic level high (V_{oH})	VCCIO-0.2	-		V
OUTPUT VOLTAGE LEVELS (2.7V≤VCCIO≤3.3V)				
Output logic level low (V_{oL})	-	-	0.4	V
Output logic level high (V_{oH})	VCCIO-0.4	-	-	V

If the value of digital terminals is in the above range, it will be correctly judged as high level or low level.

6.4 Clock Frequency

Description	Min.	Typ.	Max.	Unit
CRYSTAL REQUIREMENT				
Nominal Frequency	-	24	-	MHz
Frequency Stability over Temperature	-	±20	-	ppm

6.5 Power Consumption

BTA3X module power consumption	
[Condition] - BTA3X is mounted EVB, Control BTA3X from PC via USB-Serial conversion board. - 3.7V battery voltage, VBAT=3.7V, VCCIO=3.3V, VCCSPK=HV=3.1V - Analog differential output without speaker loading, Analog gain setting=1dB; Digital gain setting=0dB - Test device: iPhone 8 (iOS 13.6.1), Max volume setting	
Operation Mode	Power Consumption (mA)
Analog Output (differential signal)	
Power Off mode	0.32
Power On mode (no pairing, no connection)	4.85
Classic Pairing mode	5.37
Classic connected mode	5.15
SBC audio streaming mode@1KHz sine wave	10.75
BLE Pairing mode	5.20
BLE connected mode	5.04
BLE data transfer@BTA3X->device 20bytes/10ms	5.96
Classic Pairing mode & BLE Pairing mode	6.06
Classic connected mode@BLE connected mode	5.18
SBC audio streaming mode@1KHz sine wave BLE data transfer@BTA3X->device 20bytes/10ms	10.82
Digital I2S Output (I2S Salve Mode)	
Power Off mode	0.32
Power On mode (no pairing, no connection)	4.73
Classic Pairing mode	5.24
Classic connected mode	5.05
SBC audio streaming mode@1KHz sine wave	9.42
BLE Pairing mode	5.16
BLE connected mode	4.95
BLE data transfer@BTA3X->device 20bytes/10ms	5.84
Classic Pairing mode & BLE Pairing mode	5.93
Classic connected mode@BLE connected mode	5.15
SBC audio streaming mode@1KHz sine wave BLE data transfer@BTA3X->device 20bytes/10ms	9.97

➢ 7. RF Subsystem

7.1 Radio Transceiver

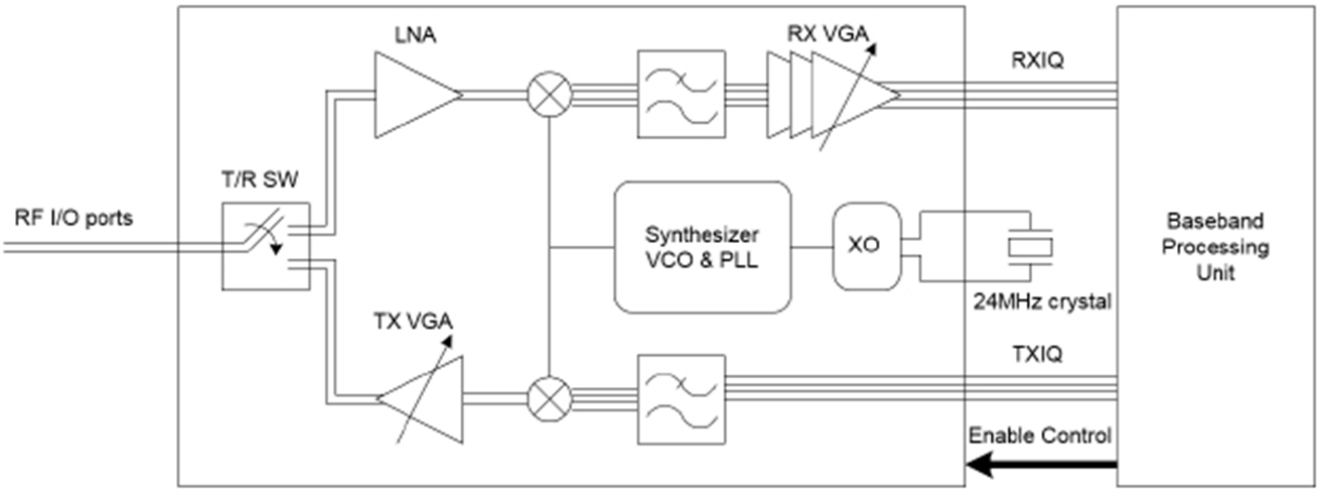
BTA3X RF transceiver is a 2.4GHz-band transceiver for Bluetooth headset applications. There are three main components at the core of its functionality:

(1). Transmitter

(2). Receiver

(3). Synthesizer

The Baseband Processing Unit supplies the Enable Control signals for each of these functions.



The RX input port and TX output port use the same RF terminal so that an external T/R switch is not necessary. Only a few matching components are placed outside of the RF terminals.

7.1.1 Transmitter

The RF transmitter is comprised of a LPF, a modulator, and a VGA stage. A baseband DAC feeds the TX baseband signals which are generated by the baseband modulators. A LPF is implemented to attenuate the second side-lobe of the signal spectrum and reject unwanted oversampling clock or invalid signals. The LPF 3dB bandwitch can be adjusted via the RF registers. The VGA supplies variable gain with more than 20dB dynamic range, and can be controlled via the RF register interface.

7.1.2 Receiver

The RF receiver is composed of two parts:

(1). RF front-end

(2). IF part

The RF front-end includes a low-noise amplifier (LNA) and a quadrature mixer. The IF part includes a low-pass filter(LPF) for out-band filtering, and a variable gain amplifier (VGA) uses the same RF ports as the TX output. The RX front-end gain can be adjusted so that it reduces the probability of bit errors caused by a poor signal-to-noise ratio. The quadrature mixer (after the LNA) converts the RF signal to the IF band.

At the IF part, the down-converted signal is first low-pass filtered by the LPF at the IF part. The signal is then amplified by the VGA, and sent to the ADC for demodulation. The LPF 3dB bandwidth can be adjusted via the RF registers. The LNA and VGA provide more than 80dB gain control range.

7.1.3 Synthesizer

The synthesizer is a fractional-N type with an embedded VCO and a loop filter without the need of external components. It also includes an internal crystal oscillator so that only an external 24MHz crystal is required.

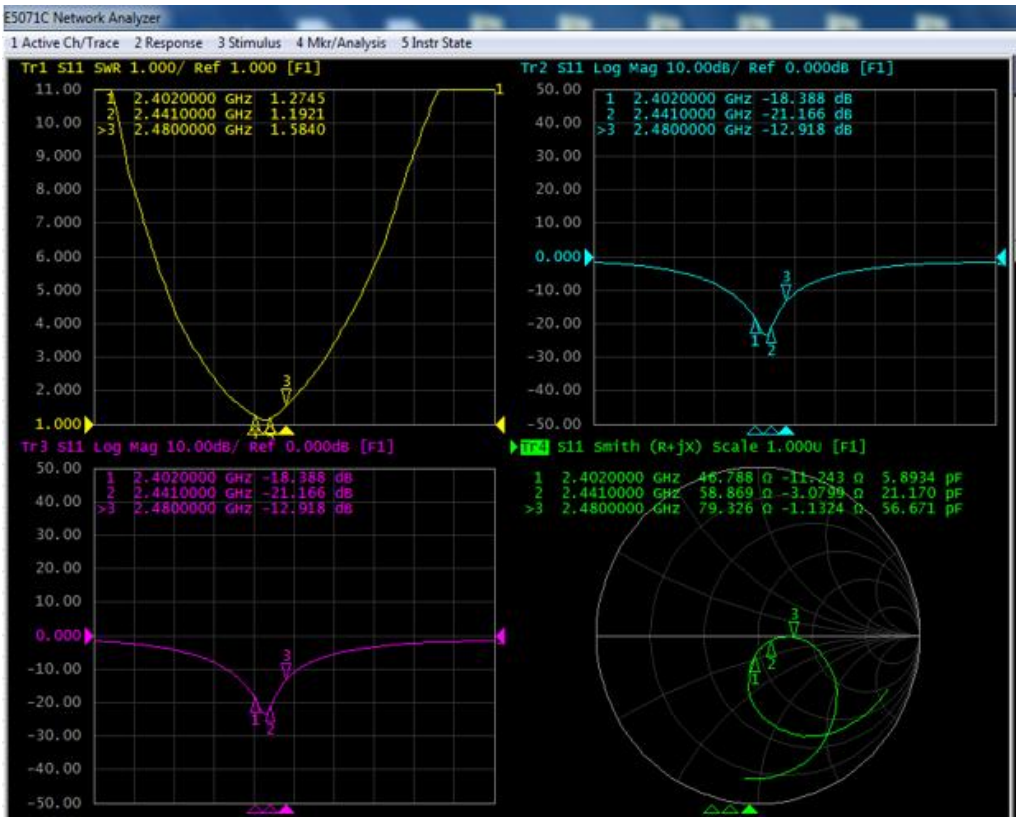
7.2 Transmitter and Receiver specifications

Items	Units	Min.	Typ.	Max.
Frequency Range	MHz	2402	-	2480
RF Output Power - Basic Data Rate	dBm	0	2	4
RF Output Power - Enhanced Data Rate	dBm	0	2	4
RF Output Power - Low Energy	dBm	0	2	4
RF Power Control Gain Step Range	dBm	2	4	8
RF Receiver Sensitivity - BR	dBm	-	-93	-70
RF Receiver Sensitivity - 2DH5	dBm	-	-92	-70
RF Receiver Sensitivity - 3DH5	dBm	-	-85	-70
RF Receiver Sensitivity – BLE 1Mbps	dBm	-	-96	-70
Crystal Frequency Calibration	KHz	-5	0	+5
Modulation Characteristics	KHz	140	160	175
Carrier Frequency Drift	KHz	-30	0	30

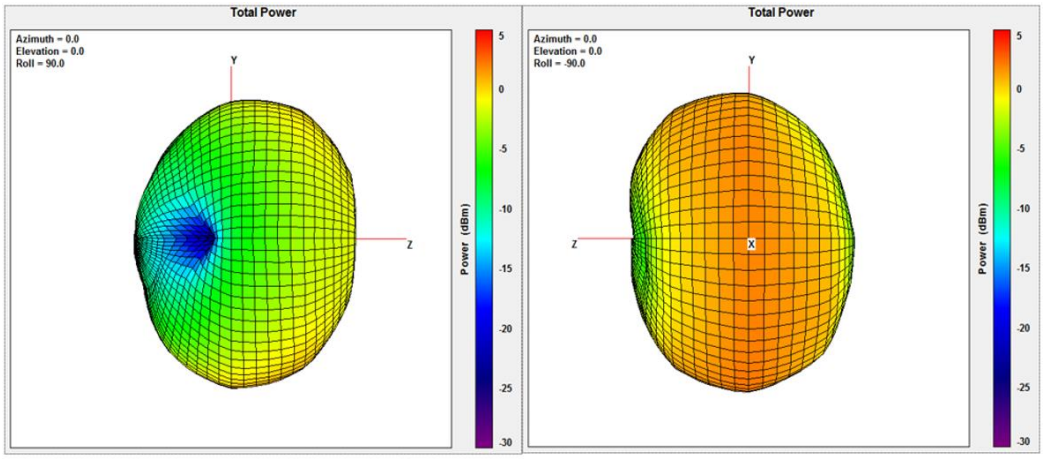
7.3 Antenna Performance

Max Gain	3.30dBi @ 2455MHz
Max Effieiency	82.28% @2456MHz

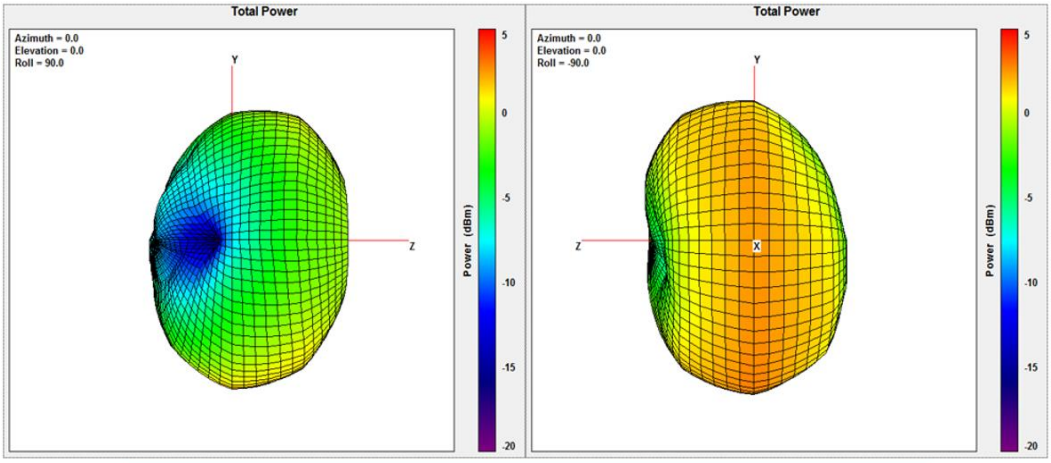
7.3.1 VSWR, Return Loss, Impedance



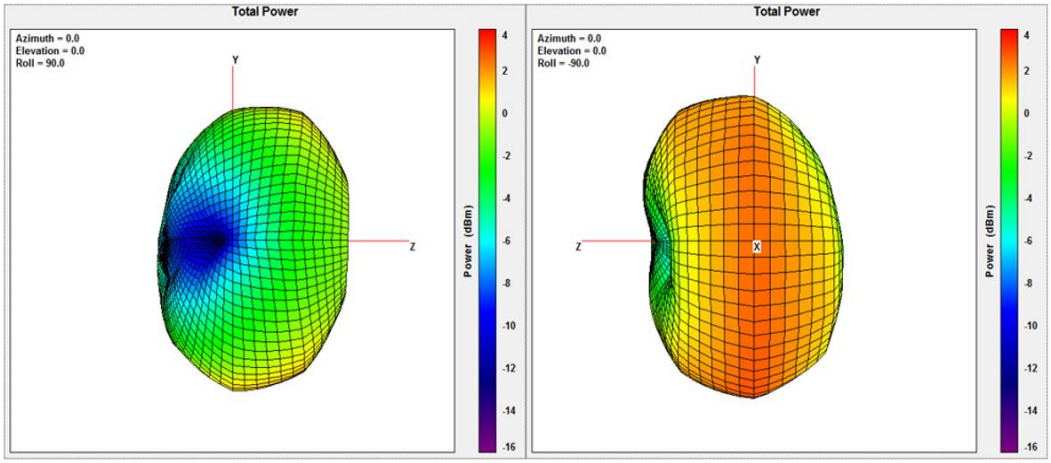
7.3.2 Antenna 3D Radiation Pattern



Frequency (MHz)	Efficiency (%)	Gain (dBi)
2402	69.87	2.46



Frequency (MHz)	Efficiency (%)	Gain (dBi)
2441	77.85	3.08

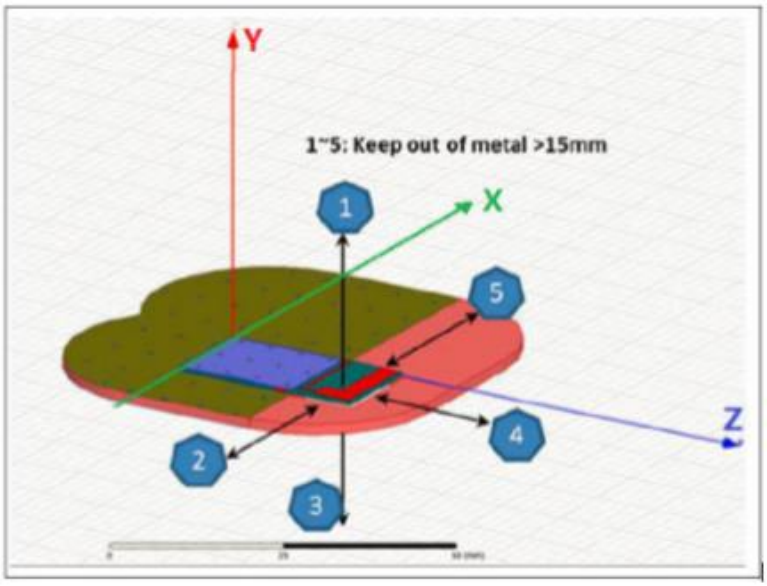


Frequency (MHz)	Efficiency (%)	Gain (dBi)
2480	79.45	3.07

➢ 8. Layout Guideline

8.1 Recommended for PWB Antenna design

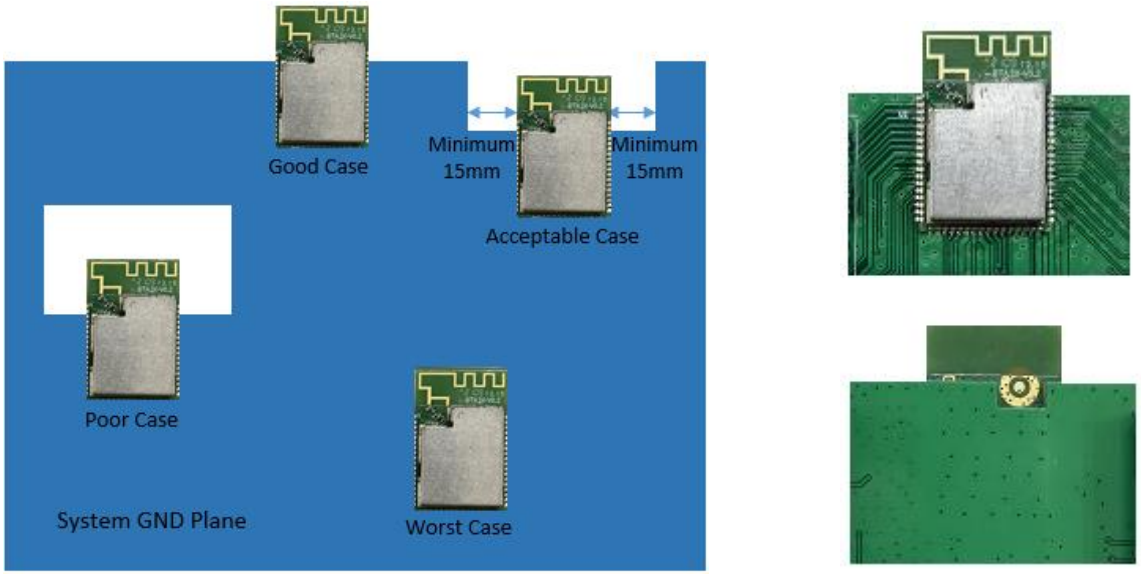
Around of the PWM Antenna should keep out of metal over 15mm, so that RF has a good performance.



8.2 Module Placement Guidelines

BTA3X has internal PCB pattern antenna, the antenna placement affects the overall performance of the system. The antenna requires free space to radiate RF signals and it must not be surrounded by the ground plane. Recommend that the areas underneath the antenna on the host PWB must not contain copper on top, inner, or bottom layers.

A low-impedance ground plane will ensure the best radio performance. The ground plane can be extended beyond the minimum recommendation, as required for the main PWB EMC noise reduction. For the best range performance, keep all external metal at least 15mm away from the on-board PWB trace antenna. Figure X.2-1 illustrates examples of good and poor placement of BTA3X module on a board with GND plane.

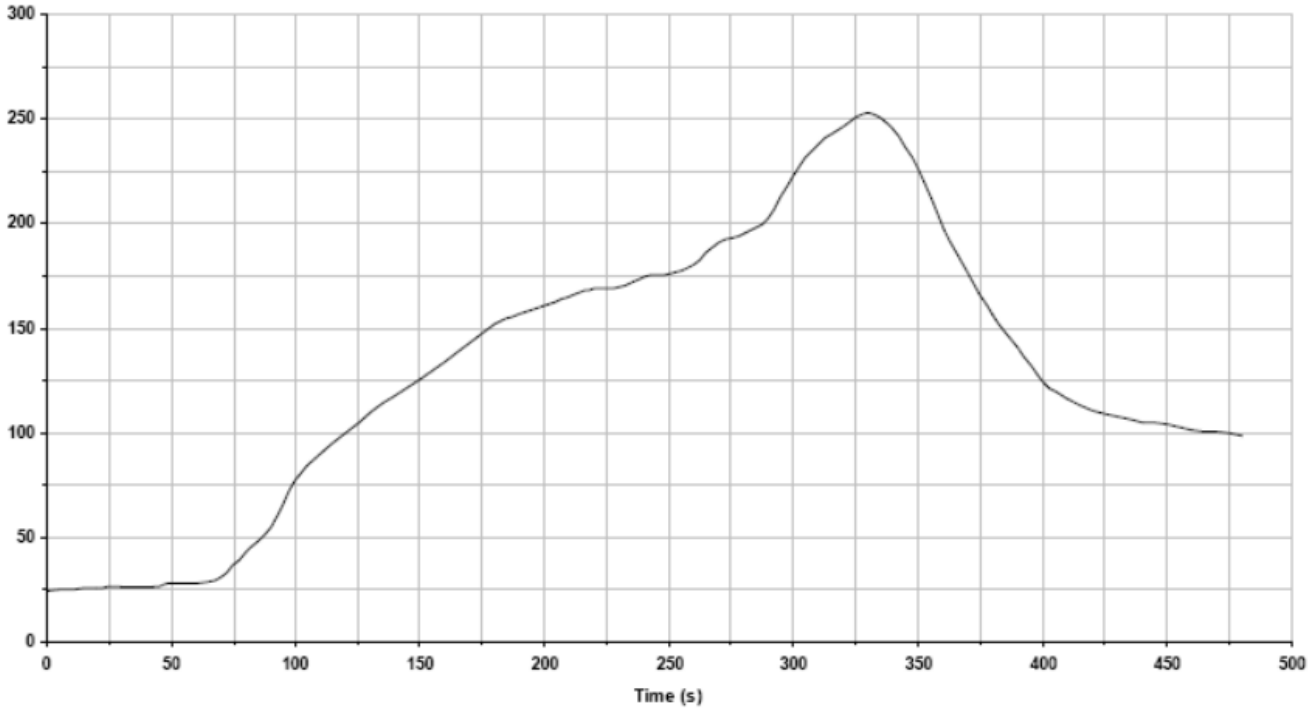


Module Placement Guidelines

➢ 9. Handling Precautions

This part specifically describes the wishes and conditions for storage, baking and mounting.

9.1 Recommended Reflow Profile



Key features of the profile:

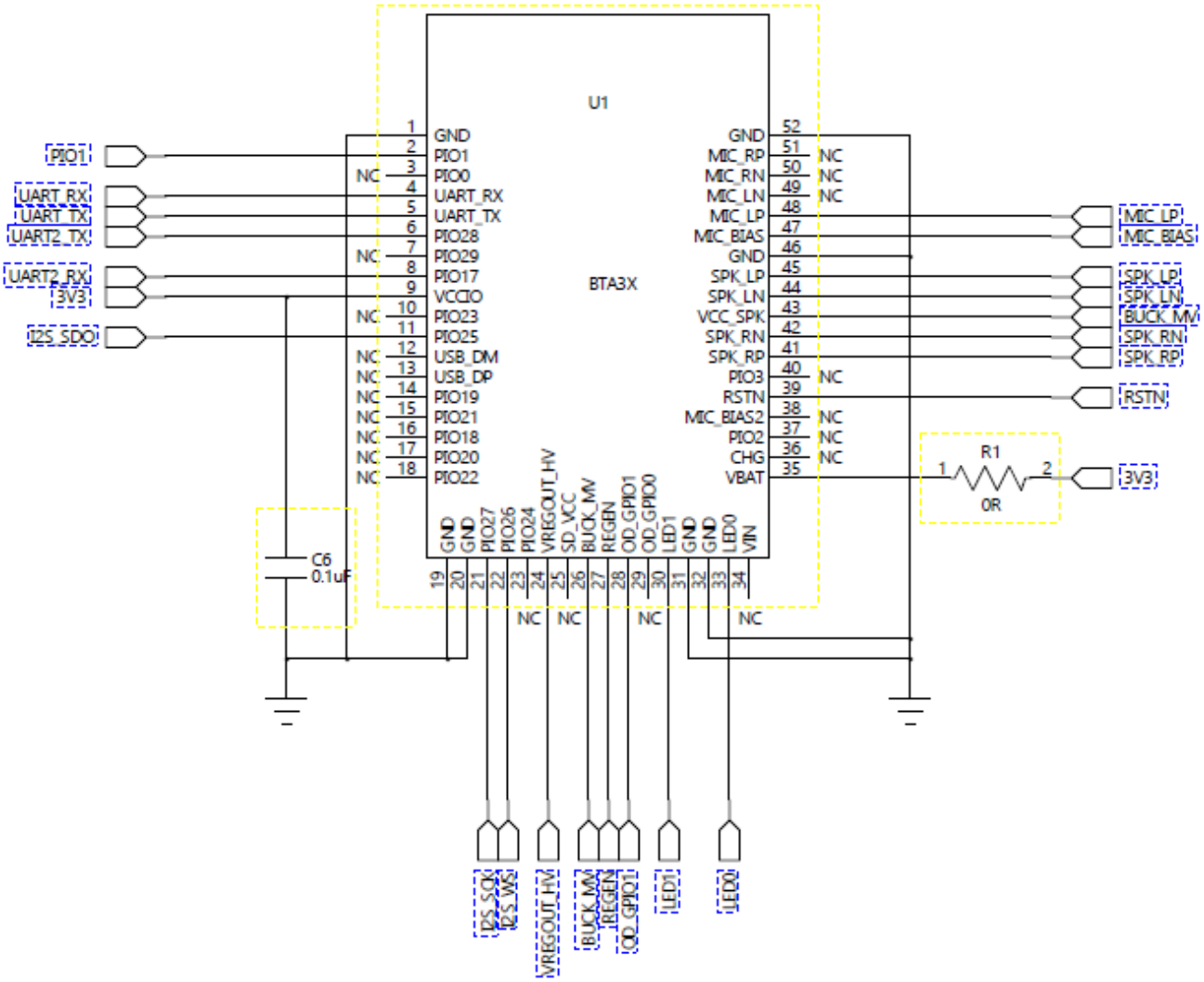
- Initial Ramp = 1-3°C /sec to 175°C equilibrium
- Equilibrium time = 60 to 90 seconds
- Ramp to Maximum temperature (255°C) = 3°C /sec Max
- Time above liquidus temperature (217°C): 60 – 90 seconds
- Device absolute maximum reflow temperature: 255℃
- Possible times of Reflow: ≤3 times

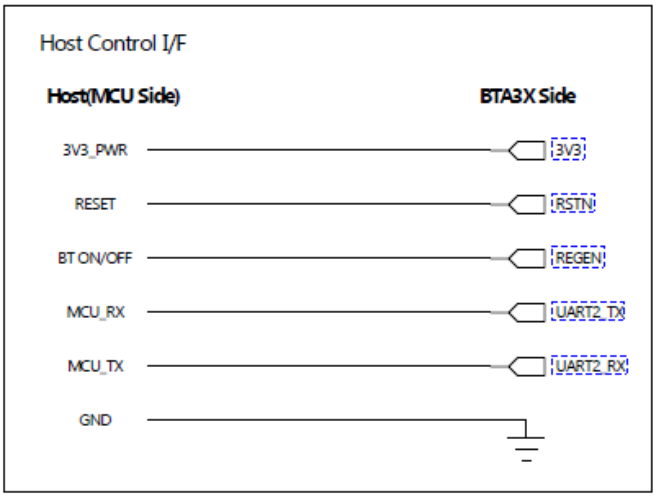
9.2 Storage and Baking Conditions

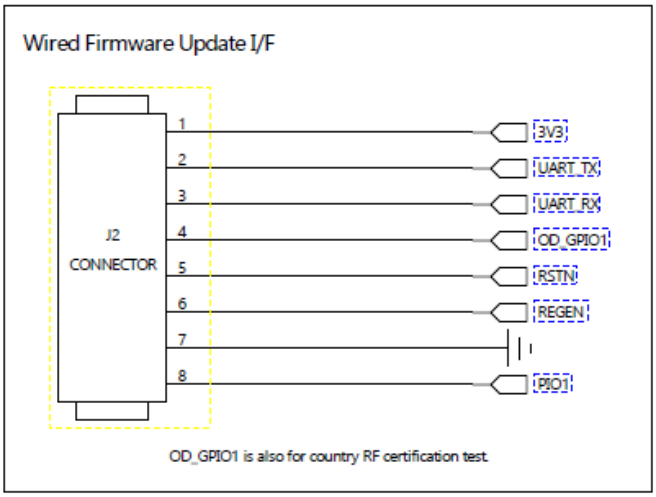
(1) If the moisture-proof package is not opened after shipment, please store in an environment of 25±3°C, 30%～60%RH.

(2) After open the moisture-proof packaging, please complete all mounting work within 168 hours.
(3) Baking Condition: if the criteria in (1), (2) are not met, please bake at 55°C, 24hours, in principle, baking should be done once.

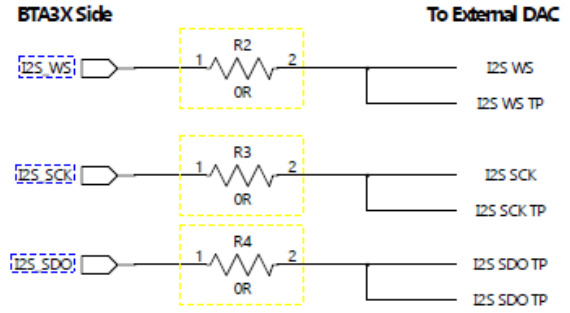
➢ 10. Reference Application Schematic



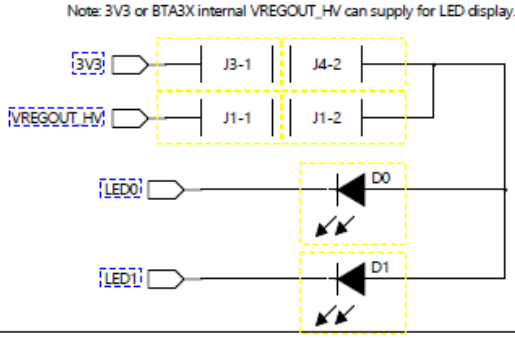




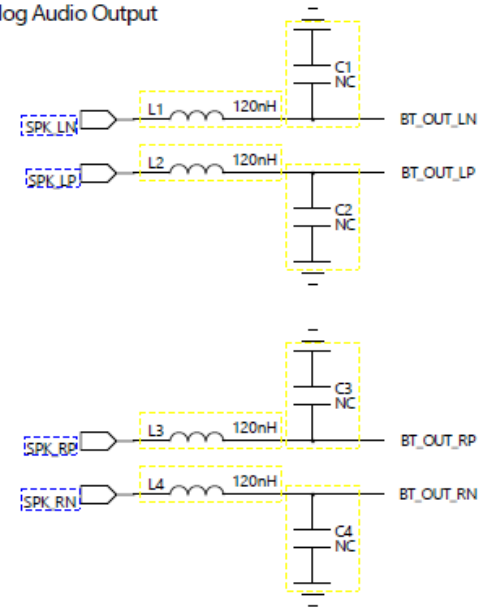
BT I2S Audio Out



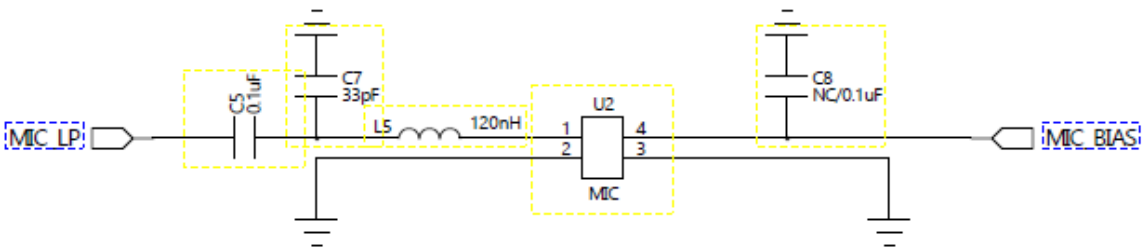
LED Display



BT Analog Audio Output



Voice Microphone



➢ 11. Module Label Specification

Label size: Length: 10mm*Width: 10mm

Label display:

“BTA3X”: Module Part Number (Fixed)

“V0025”: the BTA3X firmware version (Variable. V0025 means the firmware is V0.0.2.5)

“785EA2984D64”: 12 letters Bluetooth MAC address (Variable)

“BTA3X-YMH-G”: Customer Code (It may be changed according to guest request)

“FCC ID:XXXXXXXXXX”: USA FCC ID information (TBD)

“IC:XXXX-XXXXX”: Canada IC ID information (TBD)

“CMIIT ID:XXXXXXXXXX”: China Certification ID information (TBD)

“ANATEL:XXXXX-XX-XXXXX”: Brazil Certification ID information (TBD)

“R-X-XXX-XXXXX”: Korea Certification ID information (TBD)

QR code area: QR code includes 12 letters Bluetooth MAC address information.

Label photo image

➢ 12. Certification

12.1 Bluetooth Certification

- Declaration ID:

- QDID:

12.2 Radio Certification

BTA3X module has received obtained radio certification of the following countries or regions.

NO.	Country/Region	Certification	Standard	Certification ID/No.
1	United States	FCC ID	FCC Part 15.247 (15C)	
2	Canada	IC ID	RSS-247 Issue 2, February 2017	
3	Europe	CE RED	EMC: ETSI EN 301 489--1/-17; RF: ETSI EN 300 328 LVD: EN IEC 62368-1; MPE: EN 50663	
4	Japan	TELEC	Article 2 Paragraph 1 of Item 19, annex 43 and annex 1	
5	Taiwan, China	NCC	LP0002	
6	China	SRRC	工信部無〔2021〕129 号	
7	Korea	KCC	LARN8	
8	Brazil	ANATEL	Act 1120; Act 950; Act 14448	

➢ 13. Packaging Information

TBD

Contact Information

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Fax: +86-0755-2533-9389
E-mail: ken.ren@use-inc.co.jp

FCC Statement

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

The modular can be installed or integrated in mobile or fix devices only. This modular cannot be installed in any portable device.

FCC Radiation Exposure Statement
This modular complies with FCC RF 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. This modular must be installed and operated with a minimum distance of 20 cm between the radiator and user body.

If the FCC identification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following: “Contains Transmitter Module FCC ID: A6RBTA3X Or Contains FCC ID: A6RBTA3X”

When the module is installed inside another device, the user manual of the host must contain below warning statements;

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.

The devices must be installed and used in strict accordance with the manufacturer's instructions as described in the user documentation that comes with the product.

Any company of the host device which install this modular with Single modular approval should perform the test of radiated emissionand spurious emission according to FCC part 15C : 15.247 and 15.209 requirement,Only if the test result comply with FCC part 15C : 15.247 and 15.209 requirement, then the host can be sold legally.

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.

Single Module

IC Statement

This device complies with Industry Canada's licence-exempt RSSs. 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.

Radiation Exposure Statement

This modular complies with IC RF 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. This modular must be installed and operated with a minimum distance of 20 cm between the radiator and user body.

If the ISED identification number is not visible when the module is installed inside another device,

then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following: "Contains Transmitter Module IC: 740B-BTA3X Or Contains IC: 740B-BTA3X"

When the module is installed inside another device, the user manual of the host must contain below warning statements;

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

The devices must be installed and used in strict accordance with the manufacturer's instructions as described in the user documentation that comes with the product.

Any company of the host device which install this modular with Single modular approval should perform the test of radiated emission and spurious emission according to RSS-247 requirement, Only if the test result comply with RSS-247 requirement， then the host can be sold legally.

Cet appareil est conforme aux CNR exemptes de licence d'Industrie Canada . Son fonctionnement est soumis aux deux conditions suivantes :
(1) Ce dispositif ne peut causer d'interférences ; et
(2) Ce dispositif doit accepter toute interférence , y compris les interférences qui peuvent causer un mauvais fonctionnement de l'appareil.

Déclaration d'exposition aux radiations
Ce module est conforme aux limites d'exposition aux rayonnements RF IC définies pour un environnement non contrôlé.
environnement. Cet émetteur ne doit pas être co-localisé ou fonctionner en conjonction avec tout autre antenne ou émetteur. Ce module doit être installé et utilisé avec une distance minimale de 20 cm entre le radiateur et le corps de l'utilisateur.

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/IC authorization for this module in combination with the host equipment is no longer considered valid and the FCC ID/IC 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/IC 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/IC 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: A6RBTA3X, IC: 740B-BTA3X”.

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.

2.2 List of applicable FCC/IC rules
List the FCC/IC 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/ICES-003) 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)/RSS-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/IC (new application).
Explanation: This module complies with FCC/IC 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/IC statement, FCC ID: A6RBTA3X, IC: 740B-BTA3X.

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/IC 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: A6RBTA3X, IC: 740B-BTA3X."

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/IC 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/ICES-003 disclaimer

The grantee should include a statement that the modular transmitter is only FCC authorized for the specific rule parts (i.e., FCC/IC transmitter rules) listed on the grant, and that the host product manufacturer is responsible for compliance to any other FCC/IC 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/ICES-003 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/ICES-003 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/ICES-003. The host shoule be evaluated by the FCC Subpart B/ICES-003.