Bluetooth Module

HSBT3021-AB-IA

Datasheet

HANSONG (NANJING) TECHNOLOGY CO. , LTD.

APROVED	MANAGER	CHECKED	FILLED

Customer.

S.MANAGER	MANAGER	CHECKED	CHIEF	FILLED

Revision control

Revision	Date/Author	Check by	Approve by	Remarks
V1.0	Bruce/6.10.2021			Initial

Contents

1 Overview

HSBT3021-AB-IA Bluetooth module is an intelligent wireless audio data dual-mode transmission product independently developed by the company, which is high-end and efficient stereo wireless transmission scheme, the module adopts QCC30xx series chips to provide the module with high quality sound quality and compatibility better performance.

The HSBT3021-AB-IA Bluetooth module adopts the drive free mode. Customers only need to connect the module to the application product, and it can be fast realize the wireless transmission of music and enjoy the fun of wireless music.

2 Features

- **n** Main Chipset : QCC-3021-0-80PQFN-TR-00-0
- **n** Fully qualified single-chip dual-mode Bluetooth v5.1 system
- **n** High-performance programmable Bluetooth® stereo audio SoC
- **n** Tri-core processor architecture with low power for extended battery life
- **n** 120 MHz Qualcomm® Kalimba™ audio DSP
- **n** 32 MHz Developer Processor for applications
- **n** Firmware Processor for system
- **n** Flexible QSPI flash programmable platform
- **n** Advanced audio algorithms
- **n** High-performance 24-bit stereo audio interface
- **n** SBC, and AAC audio codecs support
- **n** Serial interfaces: UART, Bit Serializer (I^2C/SPI)
- **n** Size :20.4mm x 14.5mm x 3.0mm

HSBT3021-AB-IA

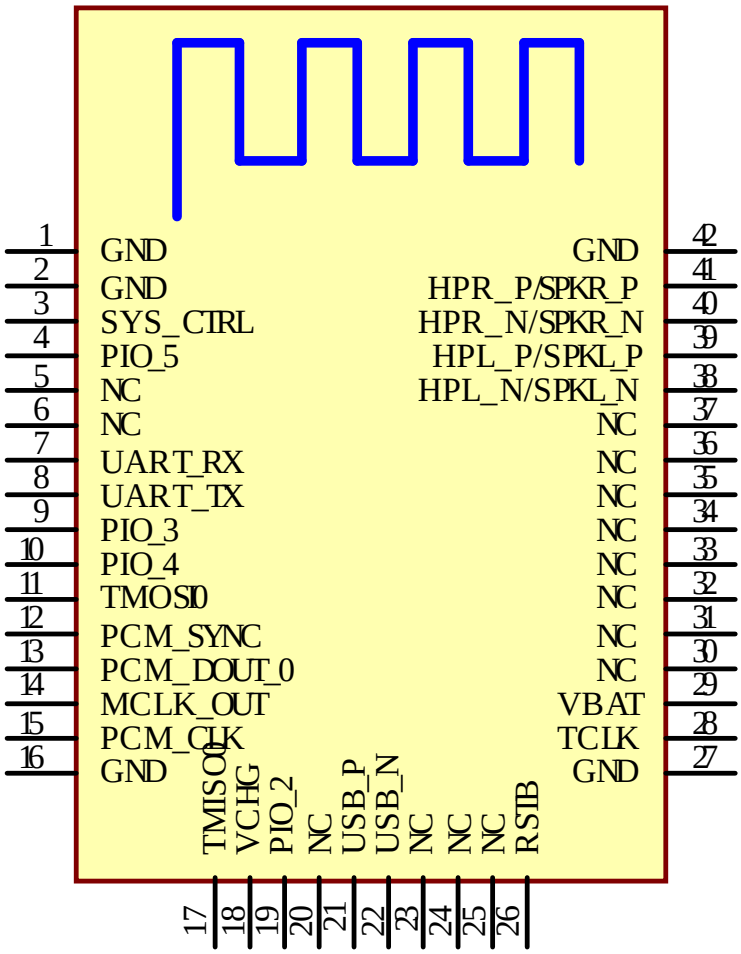
3 Applications

- Stereo Wireless Headsets.
- Wired stereo headsets and headphones.
- Portable stereo speakers.
- Home Audio System.

4 Specifications

Model	HSBT3021-AB-IA
Bluetooth specifications	Fully qualified single-chip dual-mode Bluetooth v5.1system
Modulation mode	GFSK, π / 4 DQPSK, 8DPSK
Supply voltage	3.3-5.0V
Support Bluetooth protocol	A2DP V1.3.1, AVRCP v1.6, HFP V1.7, HSP v1.2 SPP v1.2，DID v1.3，HOGP v1.0，PXP v1.0.1 FMP v1.0，BAS v1.0
Working current	≤ 20mA
Standby current	< 500uA
Temperature range	- 40 ° C to + 85 ° C
Wireless transmission range	more than 10m
Transmission power	support class 1 / class 2 / class 3 with maximum adjustable 10dbm
Sensitivity	- 80 DBM < 0.1% BER
Frequency range	2.402GHz-2.480GHz
External interface	PIO, SPI, UART, I2S, SPK (L / R)
Support system	Android, IOS and windows
Audio decoding output	SBC, and AAC
Audio SNR	≥75dB
Distortion	≤ 0.1%
Module size	20.4mm x 14.5mm x 3.0mm

5 Pin view


1 GND
2 GND
3 SYS_CTRL
4 PIO_5
5 NC
6 NC
7 UART_RX
8 UART_TX
9 PIO_3
10 PIO_4
11 TMOSI0
12 PCM_SYNC
13 PCM_DOUT_0
14 MCLK_OUT
15 PCM_CLK
16 GND
17 TMISO0
18 VCHG
19 PIO_2
20 NC
21 USB_P
22 USB_N
23 NC
24 NC
25 NC
26 RSTB
42 GND
41 HPR_P/SPKR_P
40 HPR_N/SPKR_N
39 HPL_P/SPKL_P
38 HPL_N/SPKL_N
37 NC
36 NC
35 NC
34 NC
33 NC
32 NC
31 NC
30 NC
29 VBAT
28 TCLK
27 GND

6 Pin Assignment

Pin No.	Pin Name	Pin Type	Description
1.	RF	RF	Bluetooth transmit/receive.
2.	GND	GND	Common Ground
3.	SYS_CTRL	Digital input	Typically connected to an ON/OFF push button. Boots device in response to a button press when power is still present from battery and/or charger but software has placed the device in the OFF or DORMANT state. Additionally useable as a digital input in normal operation. No pull. Additional function: **n** PIO[0] input only
4	PIO_5	Digital: Bidirectional with programmable strength internal pullup/pull-down	Programmable I/O line 5. Alternative function: **n** TBR_MISO[1]
5.6.	NC	NC	Not used.
7.	UART_RX	Digital: Bidirectional with programmable strength internal pullup/pull-down	Programmable I/O line 20. Alternative function: **n** PCM_DOUT[1]
8.	UART_TX	Digital: Bidirectional with programmable strength internal pullup/pull-down	Programmable I/O line 19. Alternative function: **n** TBR_MISO[2]
9	PIO_3	Digital: Bidirectional with programmable strength internal pullup/pull-down	Programmable I/O line 3 Alternative function: **n** TBR_MOSI[1]
10	PIO_4	Digital: Bidirectional with programmable strength internal pullup/pull-down	Programmable I/O line 4. Alternative function: **n** PCM_DIN[0]
11.	TMOSI0	Digital: Bidirectional with programmable strength internal pullup/pull-down	Programmable I/O line 6. Alternative function: **n** TBR_MOSI[0]

12.	PCM_SYNC	Digital: Bidirectional with programmable strength internal pullup/pull-down	Programmable I/O line 17. Alternative function: **n** PCM_SYNC
13.	PCM_DOUT_0	Digital: Bidirectional with programmable strength internal pullup/pull-down	Programmable I/O line 18. Alternative function: **n** PCM_DOUT[0]
14.	MCLK_OUT	Digital: Bidirectional with programmable strength internal pullup/pull-down	Programmable I/O line 15. Alternative function: **n** MCLK_OUT
15.	PCM_CLK	Digital: Bidirectional with programmable strength internal pullup/pull-down	Programmable I/O line 16. Alternative function: **n** PCM_CLK
16.	GND	GND	Common Ground
17.	TMISO0	Digital: Bidirectional with programmable strength internal pullup/pull-down	Programmable I/O line 7. Alternative function: **n** TBR_MISO[0]
18	VCHG	Supply	Supply to SMPS power switch from charger input.
19	PIO_2	Digital: Bidirectional with programmable strength internal pullup/pull-down	Programmable I/O line 2. Alternative function: **n** TBR_MISO[3]
19.20	NC	NC	Not used.
21	USB_P	Digital	USB Full Speed device D+ I/O.
22	USB_N	Digital	USB Full Speed device D- I/O.
23.24.25.	NC	NC	Not used.
26.	RSTB	Digital: Bidirectional with programmable strength internal pullup/pull-down	Automatically defaults to RESET# mode when the device is unpowered, or in off modes. Reconfigurable as a PIO after boot. Alternative function: **n** Programmable I/O line 1
27.	GND	GND	Common Ground
28.	TCLK	Digital: Bidirectional with programmable strength internal pullup/pull-down	Programmable I/O line 8. Alternative function: **n** TBR_CLK
29.	VBAT	Supply	3V3 power input.

30.31.32. 33.34.35. 36.37.	NC	NC	Not used.
38.	HPL_N/SPKL_N	Analog	Headphone/speaker differential left output, negative.. Alternative function: **n** Differential left line output, negative.
39.	HPL_P/SPKL_P	Analog	Headphone/speaker differential left output, positive. Alternative function: **n** Differential left line output, positive
40.	HPR_N/SPKR_N	Analog	Headphone/speaker differential right output, negative.. Alternative function: **n** Differential right line output, negative.
41.	HPR_P/SPKR_P	Analog	Headphone/speaker differential right output, positive. Alternative function: **n** Differential right line output, positive
42.	GND	GND	Common Ground

7 Interfaces

7.1 PIO

The following HSBT3021-AB-IA functions have specific pad allocations:

- Transaction bridge
- Audio I² S/PCM

NOTE SPDIF, UART, and Bit Serializer (I² C/SPI) can use any PIO.

The standard digital I/O pins (PIO) on HSBT3021-AB-IA are split into separate pad domains. Each VDD_PADS domain can be separately powered, from 1.7 V to 3.6 V. When PIOs in a supply domain are used for a high-speed interface, decoupling the respective VDD_PADS pin with a 100 nF decoupling capacitor may be beneficial. The VDD_PADS of a particular pin should be powered before voltages are applied to any PIO powered by that domain, otherwise back
powering can occur through the electrostatic discharge (ESD) protection in the pad.
PIO can be programmed to have a pull-up or pull down with two strengths (weak and strong).
PIO can also be programmed with a sticky function where they are strongly pulled to their current input state. PIO have a reset pull state, after reset the pulls can be re-configured by software.
PIO also have a programmable drive strength capability of 2, 4, 8, or 12 mA.
All PIO are readable by all subsystems, but for write access are assigned by software to particular subsystem control. PIO inputs are via Schmitt triggers.

7.2 Transaction bridge

The transaction bridge is an external bridge into the internal transaction bus between HSBT3021-AB-IA subsystems. It is the primary debug interface and can also be used for production programming.
A USB to transaction bridge interface (TRBI200) is available. For details, contact a QTIL sales representative.
The transaction bridge is multiplexed on PIO[8:2], see Table 7.2-1.

NOTE A direct USB2.0 connection from a host computer to the HSBT3021-AB-IA can be used for most debugging and programming activities. For more details, see ADK documentation.
TRBI200 can use USB3.0 for maximum data rate.

NOTE USB3.0 signals can generate noise in the Bluetooth ISM band. For applications where sensitive RF measurements take place, QTIL recommends connecting TRBI200 using USB2.0.
The transaction bridge is a multilane interface, and only requires three wires for its minimum configuration (suitable for production programming).

NOTE The TRBI200 USB transaction bridge interface requires power for input/output

buffers to be supplied externally. This voltage must match the power supply domain used for the TRB pads (VDD_PADS_1).

NOTE Minimum configuration is sufficient for production programming and code download, but not for extensive debug and code tracing. The configuration in use is automatically detected.

Table 7.2-1 Transaction bridge PIO multiplex

TRB	PIO	Required for minimum configuration	Intermediate configuration	Full bus width
TBR_CLK	PIO[8]	Yes	Yes	Yes
TBR_MISO[0]	PIO[7]	Yes	Yes	Yes
TBR_MOSI[0]	PIO[6]	Yes	Yes	Yes
TBR_MISO[1]	PIO[5]	No	Yes	Yes
TBR_MOSI[1]	PIO[4]	No	Yes	Yes
TBR_MISO[2]	PIO[3]	No	No	Yes
TBR_MISO[3]	PIO[2]	No	No	Yes

NOTE PIO[7] should not be held low during boot.

Transaction bridge debug access is lockable. When locked, this interface only becomes active after the correct unlock key sequence is provided.

7.3 RESET# reset

The HSBT3021-AB-IA digital reset pin (RESET#) is an active low reset signal. PIO[1] defaults to RESET# upon boot.

The pin is active low and on-chip glitch filtering avoids the need to filter out any spurious noise that may cause unintended resets. The RESET# pin has a fixed strong pull-up to VDD_PADS_1, and therefore can be left unconnected. The input is asynchronous, and is pulse extended within HSBT3021-AB-IA to ensure a full reset.

HSBT3021-AB-IA contains internal Reset Protection functionality to automatically keep the power rails enabled and enable the system to restart after unintended reset (such as a severe ESD event). Assertion of RESET# beyond the Reset Protection timeout (typically greater than ~1.8 s) causes the device to power down if VCHG is not present and SYS_CTRL is low. HSBT3021-AB-IA then requires a SYS_CTRL assertion or VCHG attach to restart.

NOTE HSBT3021-AB-IA is always powered if VCHG is present. It does not power down if RESET# is asserted while VCHG remains present.

QTIL recommends that HSBT3021-AB-IA is powered down via software-controlled methods rather than external assertion of RESET#.

Holding RESET# low continuously is not the lowest HSBT3021-AB-IA power state, because pull downs are enabled on VCHG and VDD_BYP in this state.

RESET# is guaranteed to work if held low for 120us.

After boot, PIO[1] is configurable as a digital PIO.

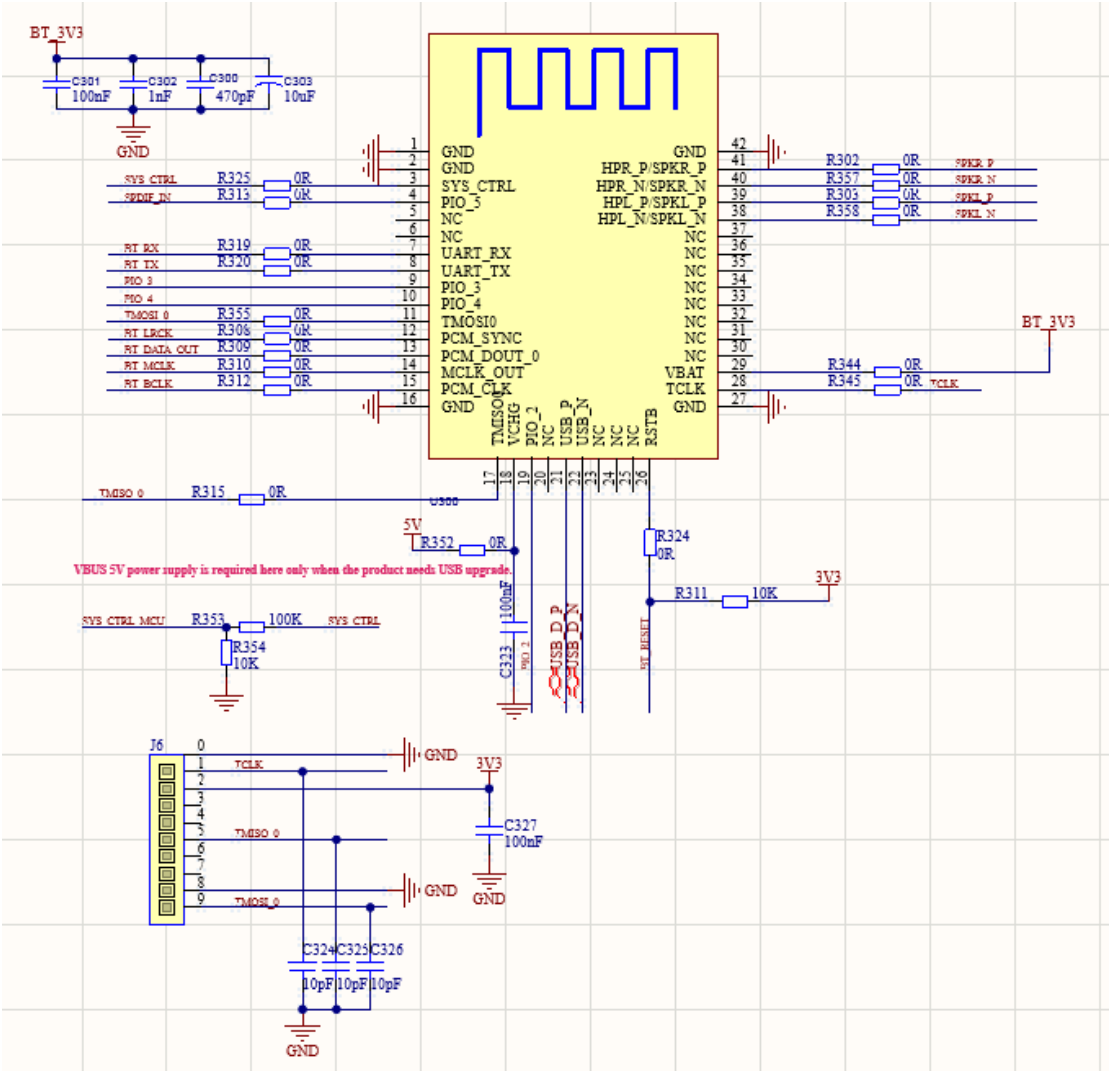
7.4 SYS_CTRL

SYS_CTRL is an input pin that acts as a power on signal for the internal regulators. It can also be used as an input (appears to software as virtual PIO[0]) or as a multifunction button.
From the OFF state, SYS_CTRL must be asserted for >20 ms to start power up.
SYS_CTRL is VBAT tolerant (4.8 V max), and typically connected via a button to VBAT.
SYS_CTRL has no internal pull resistor, and requires an external pull-down if left undriven.
SYS_CTRL can be logically disconnected from the power on signal for internal regulators by software. Therefore, for example, once booted, software takes control of the internal regulators and the state of SYS_CTRL is ignored by the regulators.

7.5 Audio interfaces

- 24-bit I^2S interface with 1 input and 2 output channels
- Programmable audio master clock (MCLK).
- Sony/Philips digital interface (SPDIF): 2, configurable as input or output
- Stereo analog Class-AB headphone outputs:
  - Class-AB signal-to-noise ratio (SNR): ≥75dB.
  - Class-AB total harmonic distortion plus noise (THD +N): ≤0.1%.
- Digital-to analog converter (DAC)s support sample rates of 8, 16, 32, 44.1, 48, 96 kHz. DACs also support 192 kHz.

8 Axample application schematic



9 General Specifications

9.1 Absolute Maximum Ratings:

Ratings	Min.	Max.	Unit
Storage Temperature	-40	+85	℃
Supply Voltage (3V3_IN)	-0.4	3.6	V
RSTB	-0.4	3.8	V
SYS_CTRL	-0.4	4.8	V

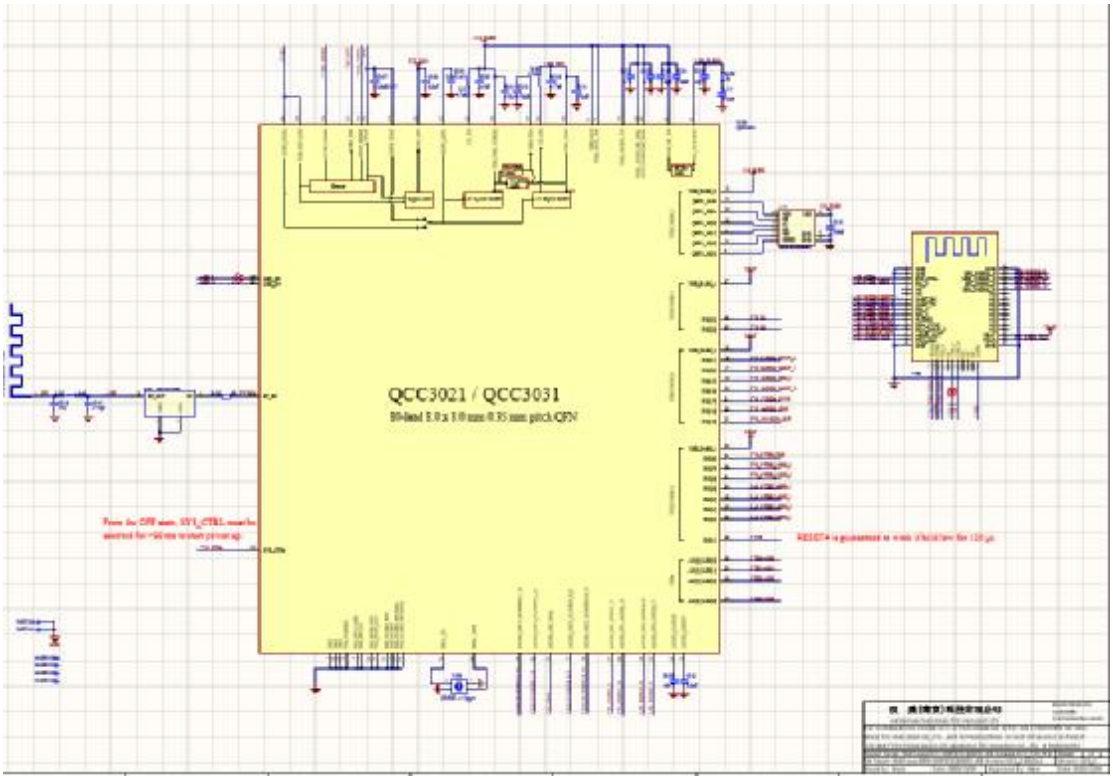
9.2 Recommended Operating Condition:

Ratings	Min	Typ	Max	Unit
Operating Temperature range	-40	20	+85	℃
Supply Voltage (VBAT)	2.8	3.7	4.6	V
RSTB	0	3.3	3.6	V
SYS_CTRL	0	3.3	3.6	V

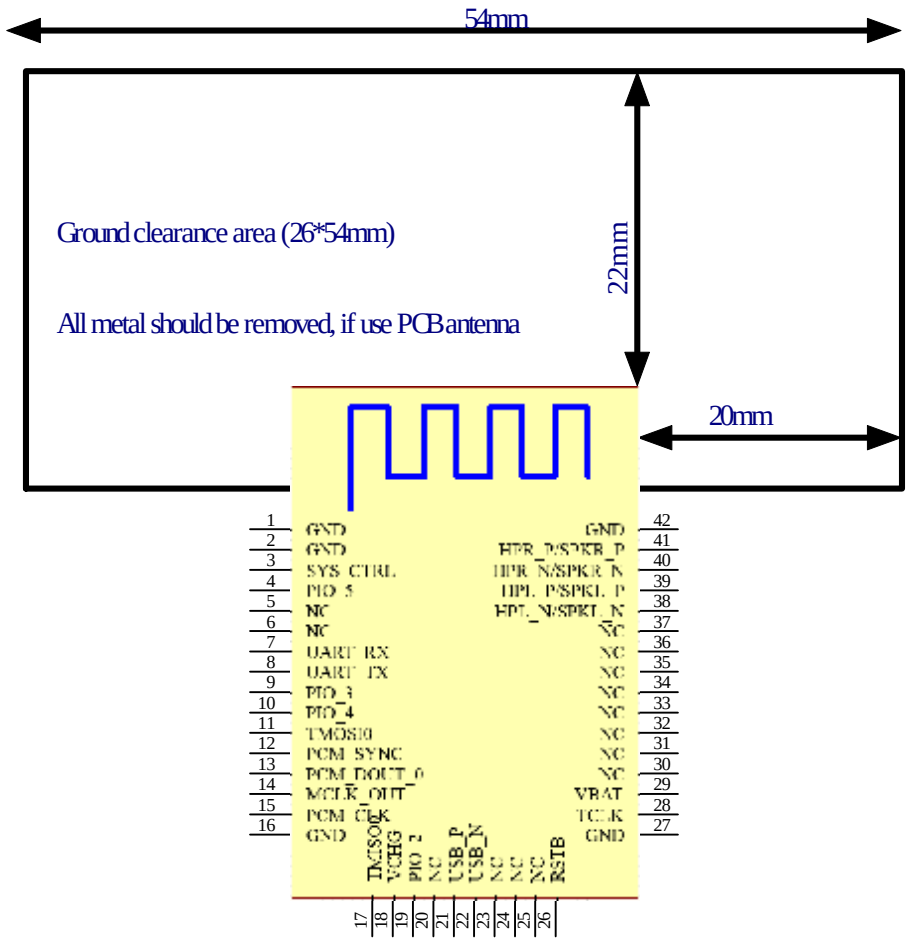
9.3 Digital terminals

	Min	Typ	Max	Unit
VDD_PADS supply	1.7	3.3	3.6	V
VIL input logic level low	-	-	0.22 x VDD_PADS	V
VIH input logic level high	0.7 x VDD_PADS	-	-	V
Drive current (configurable)	2, 4, 8, 12	4	-	mA
VOL output logic level low, at max rated drive	-	-	0.22 x VDD_PADS	V
VOH output logic level high, at max rated drive	0.75 x VDD_PADS	-	-	V
Strong pull (up & down)	15	65	150	kΩ
Weak pull (up & down)	500	2200	5000	kΩ

10 Module Schematics



11 Layout Notes



A. If there is battery, metal, LCD, loudspeaker, etc. beside the module antenna, it is required to be at least 15mm away from the antenna

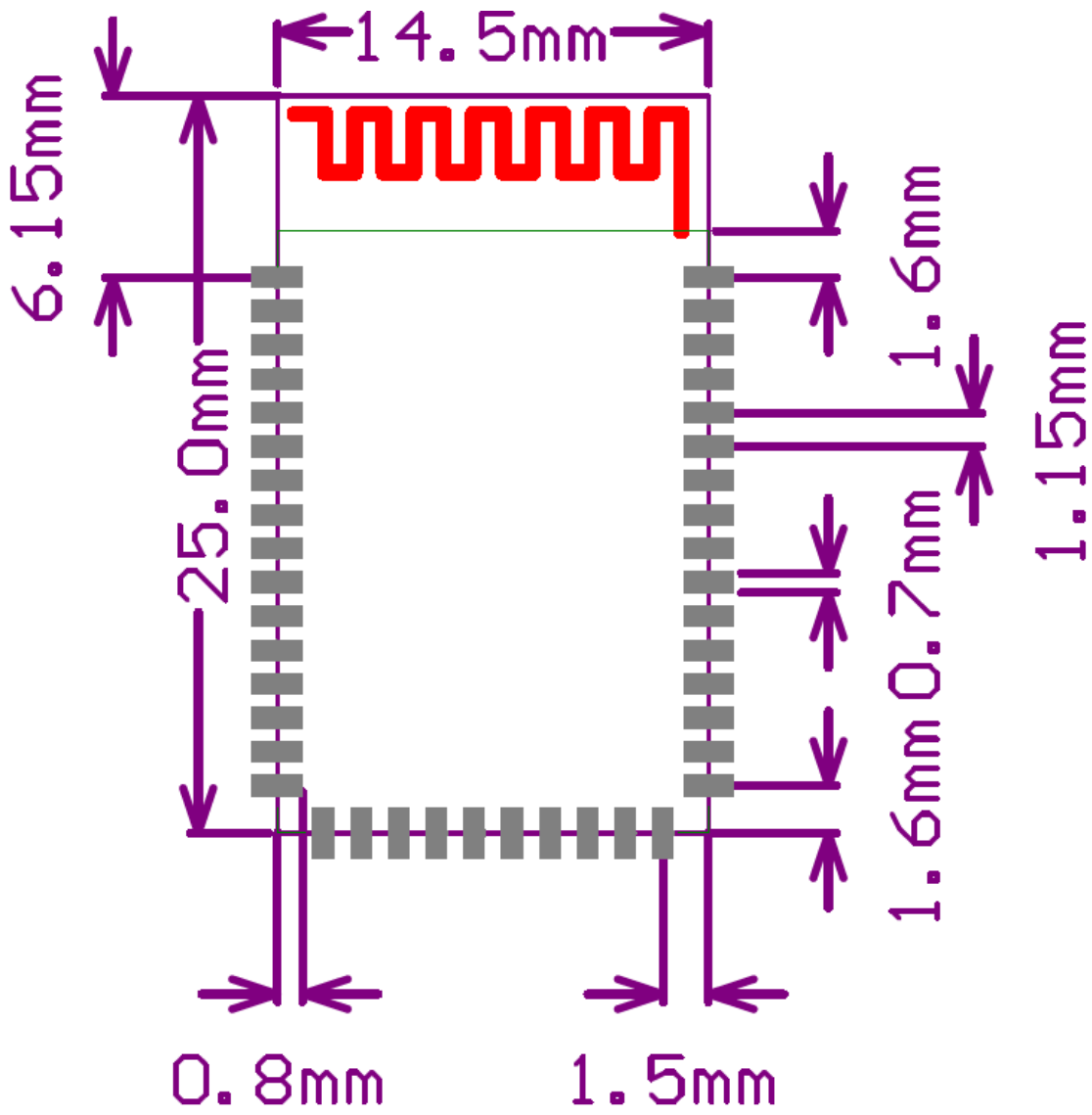
B. It is recommended to use star routing for the power supply line during layout, and ensure that the power supply linearity of Bluetooth module is good, and the ground of BT is also available

It must be separated from the ground of operational amplifier, power amplifier, MCU, etc., and there shall be no other interference ground under BT

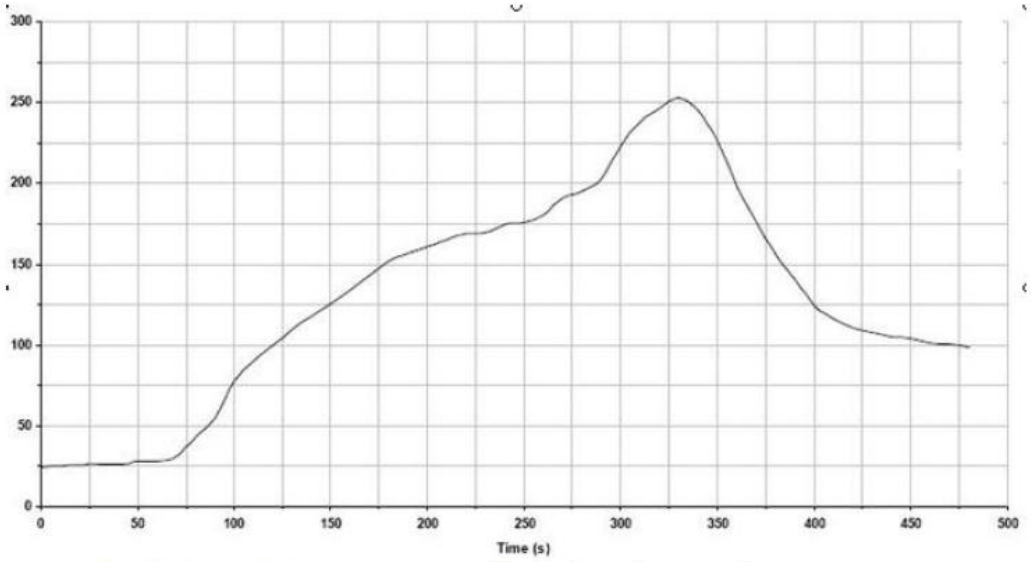
C. Do not walk around the antenna control line, power line, audio line, MIC and other interference lines

D. If there is a row base near the module antenna and the shell has metal iron mesh which has an impact on the signal, it is recommended to select a professional high-rise heater beneficial antenna.

12 Module Dimension



13 Reflow temperature



Key features of the profile:

-Initial Ramp=1-2.5℃/sec to 175℃ equilibrium

-Equilibrium time=60 to 80 seconds

-Ramp to Maximum temperature (250℃)=3℃/sec Max

-Time above liquidus temperature(217℃): 45 - 90 seconds

-Device absolute maximum reflow temperature: 250℃

14 FCC Statement

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 generate, 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.

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.

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

RF exposure warning

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment must be installed and operated in accordance with provided instructions and the antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be collocated or operating in conjunction with any other antenna or transmitter.

Conformément à la partie 15 de la Convention - cadre des Nations Unies sur les changements climatiques, le matériel satisfait aux limites numériques de la partie 15.

Ces restrictions visent à assurer une protection raisonnable contre les perturbations dommageables dans les installations résidentielles.Ce dispositif génère, utilise et peut émettre de l 'énergie radiofréquence qui, si elle n' est pas installée et utilisée conformément à la description, risque de perturber de manière préjudiciable les communications radio.

Toutefois, il n'est pas garanti qu'il n'y aura pas d'interférences dans une installation donnée.Si le dispositif provoque effectivement une interférence préjudiciable à la réception radio ou télévisée (qui peut être déterminée par la fermeture et l'ouverture du dispositif), l'utilisateur est encouragé à essayer de corriger cette interférence en:

• repositionnement ou repositionnement des antennes de réception.

• Élargissement de la distance entre le matériel et le récepteur.

• Connecter le dispositif à une prise de courant différente du circuit de connexion du récepteur.

• Consulter les distributeurs ou les techniciens de la radio et de la télévision expérimentés pour obtenir de l'aide.

Ce dispositif est conforme à la partie 15 des règles FCC.Les deux conditions de fonctionnement sont les suivantes:

1) Le présent équipement ne provoque pas de perturbations nuisibles; et

2) Le dispositif doit accepter toute interférence reçue, y compris toute interférence pouvant entraîner une manipulation accidentelle.

Avertissement FCC: toute modification ou modification qui n'a pas été expressément approuvée par la partie responsable du respect des dispositions peut rendre l'utilisateur inopérant.

Avertissement d 'exposition radiofréquence

Le dispositif est conforme aux limites d 'exposition aux rayonnements fixées par le FCC pour un environnement non réglementé.L 'équipement doit être installé et exploité conformément aux instructions fournies, et l' antenne utilisée pour l 'émetteur doit rester à une distance d' au moins 20 cm par personne et ne doit pas être configurée ou exploitée avec une autre antenne ou un autre émetteur.

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: XCO-QCC3021”.

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.

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.

WARNING

Changes or modifications not expressly approved by the manufacturer could void the user’s authority to operate the equipment.

“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.

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: 7756A-QCC3021

Le dispositif d'accueil doivent être étiquetés pour afficher le numéro de certification d'Industrie Canada du module.
Contient module émetteur IC: 7756A-QCC3021

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 FCC ID: XCO-QCC3021, Contains IC: 7756A-QCC3021”.

“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.”

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). part 15E(15.407)

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 Chip 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: XCO-QCC3021.

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: XCO-QCC3021, Contains IC: 7756A-QCC3021”

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.