BT Module

HSBT6951

Specification

Hansan (Nanjing) Technology Co., LTD

Contents

1 Overview

HSBT6951 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 AC6951C series chips to provide the module with high quality sound quality and compatibility better performance.
The HSBT6951 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

- Main Chipset： AC6951C,LQFP48
- High performance programmable Bluetooth
- 240 MHz Developer Processor for applications
- 32bit floating-point arithmetic unit
- Advanced audio algorithms
- High-performance 24-bit stereo audio interface
- Analog microphone interface
- Supports SBC and AAC audio codecs
- Serial interface:UART、USB 2.0
- Size: 34.1mm x 18.7mm x 3.0mm

3 Applications

- Stereo wireless headphones。
- Wired stereo headphones and headsets。
- Portable stereo speakers。
- Home sound system。

4 Specifications

Model	HSBT6951
Bluetooth specifications	V5.3+BR+EDR+BLE
Modulation mode	GFSK， π / 4 DQPSK，
Supply voltage	4.5V
Support Bluetooth protocol	A2DP 1.3.2， AVCTP 1.4， AVDTP 1.3， AVRCP 1.6.2，HFP 1.8，SPP 1.2，RFCOMM 1.1，PNP 1.3，HID1.1.1，SDP CORE5.3， I2CAP CORE5.3
Working current	≤ 20mA
Standby current	< 500uA
Temperature range	- 40 °C - + 85 °C
Wireless transmission range	more than 10m
Transmission power	support class 1 / class 2 / class 3 with maximum adjustable 4dbm
Sensitivity	- 85dBm
Frequency range	2.402GHz-2.480GHz
External interface	GPIO UART, USB, I2S, MIC, Lin, SPK (L / R)
Support system	Android、IOS and Windows
Audio decoding output	SBC and AAC
Audio SNR	≥75dB
Distortion	≤ 0.1%
Module size	30.9mm x 18.6mmx 3.0mm

5 Pin Assignment

Pin No.	Pin Name	Pin Type	Description
1	GND	GND	GND
2	LED5/AIO5	Digital: Bidirectional with programmable strength internal pullup/pull-down	GPIO
3	GND	GND	GND
4	TBR_MISO_0	Digital: Bidirectional with programmable strength internal pullup/pull-down	UART for debug
5	MCLK_OUT	Digital: Bidirectional with programmable strength internal pullup/pull-down	MCLK Output
6	TBR_MOSI_0	Digital: Bidirectional with programmable strength internal pullup/pull-down	UART for debug
7	TBR_CLK	NC	NC
8	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: Programmable I/O line 1
9	TBR_MISO_1	Digital: Bidirectional with programmable strength internal pullup/pull-down	GPIO
10	TBR_MISO_3	Digital: Bidirectional with programmable strength internal pullup/pull-down	GPIO
11	LED2/AIO2	Digital: Bidirectional with programmable strength internal pullup/pull-down	GPIO。
12	LED1/AIO1	Digital: Bidirectional with programmable	GPIO。

		strength internal pullup/pull-down	
13	LED0/AIO0	Digital: Bidirectional with programmable strength internal pullup/pull-down	GPIO。
14	SYS_CTRL	Digital: Bidirectional with programmable strength internal pullup/pull-down	GPIO
15	VBAT	Supply	Battery voltage input.
16	GND	GND	GND
17	VDD_IO	NC	NC
18	1V8_SMPS	NC	NC
19	GND	GND	GND
20	RSTB	NC	NC
21	CHG_EXT	NC	NC
22	VBAT_SENSE	NC	NC
23	3V3_LDO	NC	NC
24	USB_N	Digital	USB Full Speed device D- I/O.
25	USB_P	Digital	USB Full Speed device D+ I/O.
26	GND	GND	Common Ground
27	GND	GND	Common Ground
28	PCM_SYNC	Digital: Bidirectional with programmable strength internal pullup/pull-down	LRCLK
29	PCM_CLK	Digital: Bidirectional with programmable strength internal pullup/pull-down	BCLK
30	PIO_22	Digital: Bidirectional with programmable strength internal pullup/pull-down	UART_RX
31	PIO_23	Digital: Bidirectional with programmable strength internal pullup/pull-down	UART_TX
32	PCM_DIN_0	Digital: Bidirectional with programmable strength internal pullup/pull-down	PCM_DIN[0]

33	PCM_DOUT_0	Digital: Bidirectional with programmable strength internal pullup/pull-down	PCM_DOUT[0]
34	PCM_DOUT_1	Digital: Bidirectional with programmable strength internal pullup/pull-down	PCM_DOUT[1]
35	PCM_DOUT_2	Digital: Bidirectional with programmable strength internal pullup/pull-down	PCM_DOUT[2]
36	MIC1_N/ LINEIN_L_N	GND	GND
37	MIC1_P/ LINEIN_L_P	Analog	Microphone differential 1 input, positive. Alternative function: ■ Differential audio line input left, positive
38	MIC_BIAS	Analog	Mic bias output.
39	MIC2_N/ LINEIN_R_N	Analog	Microphone differential 2 input, negative. Alternative function: ■ Differential audio line input right, negative
40	MIC2_P/ LINEIN_R_P	Analog	Microphone differential 2 input, positive. Alternative function: ■ Differential audio line input right, positive
41	HPR_N/SPKR_N	GND	GND
42	SPKR_P/HPR_P	Analog	Headphone/speaker differential right output, positive. Alternative function: ■ Differential right line output, positive
43	HPL_N/SPKL_N	GND	共同点
44	SPKL_P/HPL_P	Analog	Headphone/speaker differential left output, positive. Alternative function: ■ Differential left line output, positive
45	GND	GND	GND

6 Interfaces

6.1 USB Interface

HSBT6951 has a USB device interface: An upstream port, for connection to a host Phone/PC or battery charging adaptor.
The device port is a USB2.0 Full Speed (12 Mb/s) port. Typically HSBT3031-08 enumerates as a compound device with a hub with the enabled audio source / sink / HID / mass storage device appearing behind this hub.
The DP 1.5 k pull-up is integrated in HSBT3031-08. No series resistors are required on the USB data lines.
HSBT6951 contains integrated ESD protection on the data lines to IEC 61000-4-2 (device level). In normal applications, no external ESD protection is required.

6.2 Standard I/O

The standard digital I/O pins (PIO) on HSBT3031-08 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.

6.3 RESET# reset

The HSBT6951 digital reset pin (RESET#) is an active low reset signal.

6.4 SYS_CTRL

SYS_CTRL is an IO pin that acts as a GPIO for Host. It can also be used as an input

6.5 Audio interfaces

- 24-bit I^2S interface with 1 input and 3 output channels
- Programmable audio master clock (MCLK).
- 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%.
- Dual analog inputs configurable as single ended line inputs or, unbalanced or balanced analog microphone inputs:
  - SNR single-ended: ⩾75dB.
  - THD+N single-ended: ⩾75dB.
- 1 microphone bias (single bias shared by the two channels).
  - Crosstalk attenuation between two inputs using recommended application circuit: ⩾ 75dB.
- Digital microphone inputs with capability to interface up to 6 digital microphones.
- Both analog-to-digital converter (ADC)s and digital-toanalog converter (DAC)s support sample rates of 8, 16, 32, 44.1, 48, 96 kHz. DACs also support 192 kHz.

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7 Power supply

Single 4.2V only supply (3.3V for I/O)

For improving the noise, recommend adding one 10Uf capacitor on the power supply pin

8 General Specifications

8.1 Absolute Maximum Ratings：

Ratings	Min.	Max.	Unit
Storage Temperature	-40	+85	℃
Power	-0.4	5.5	V
RSTB	-0.4	3.8	V
GPIO	-0.4	3.8	V
SYS_CTRL	-0.4	3.8	V

8.2 Recommended Operating Condition：

Ratings	Min	Typ	Max	Unit
Operating Temperature range	-40	20	+85	℃
Power	3.7	4.2	5.5	V
RSTB	0	-	3.3	V
GPIO	0	-	3.3	V
SYS_CTRL	0	-	3.3	V

9 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

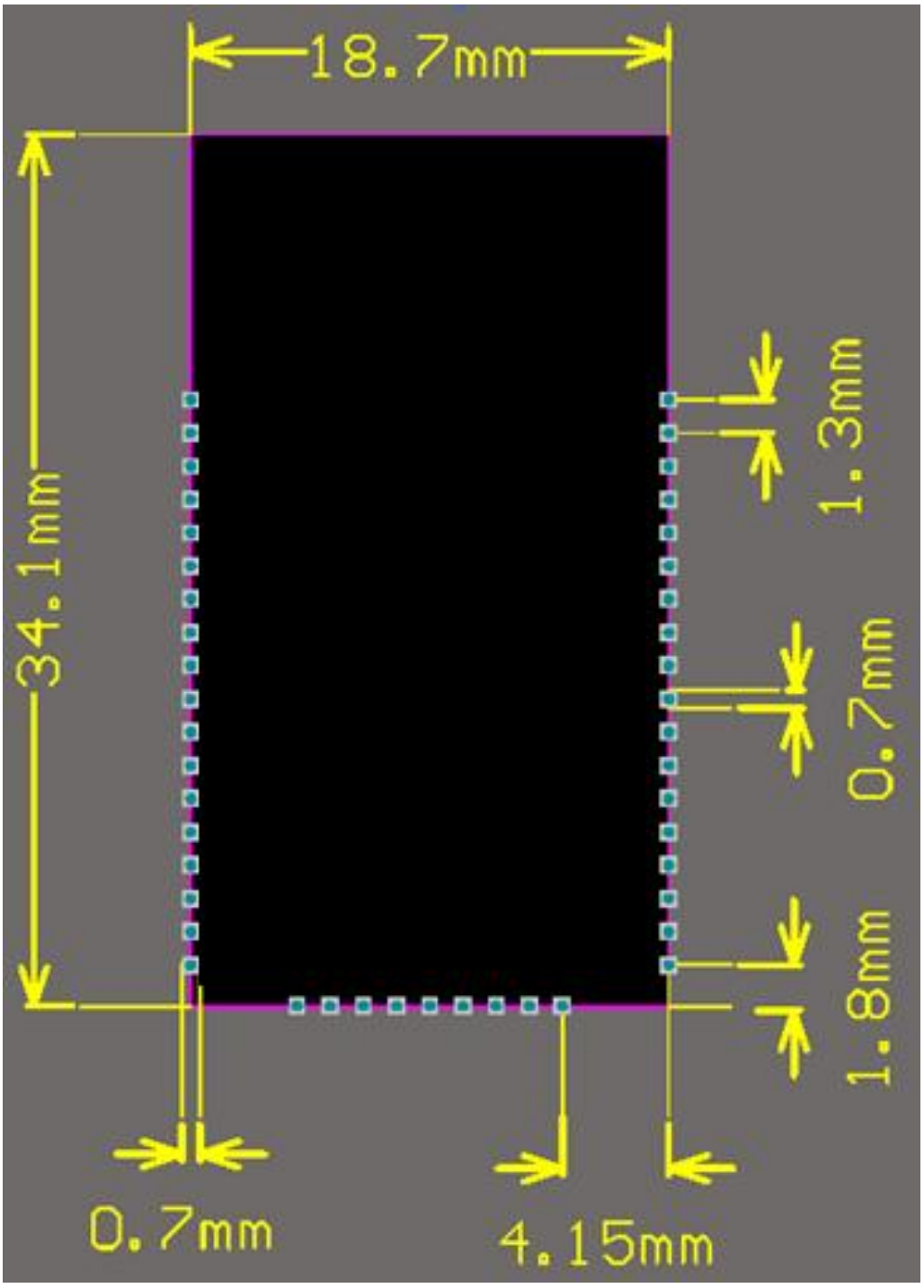
B. It is recommended to use star routing for the power supply line during layout, and ensure that the power supply linearity of Bluetooth module is good, and the ground of BT is also available

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

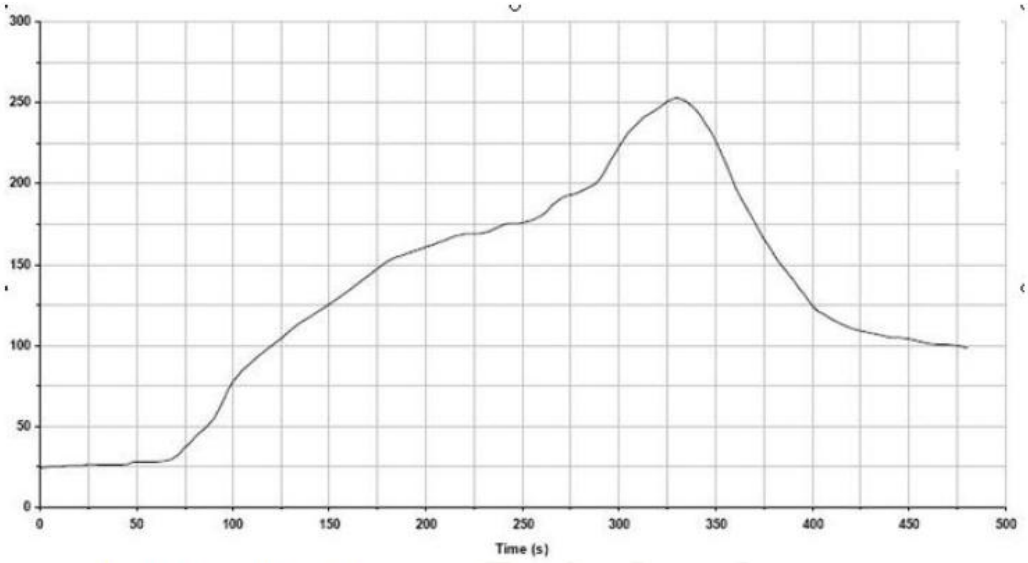
C. Do not walk around the antenna control line, power line, audio line, MIC and other interference lines

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。

10 Module Dimension



11 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℃

12 FCC ISED Statement

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-HSBT6951

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

Contient module émetteur IC: 7756A-HSBT6951

Information for OEM Integrator

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

1) The antenna must be installed such that 5mm 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: 7756A-HSBT6951 ”.

“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 5mm between the radiator and your body. This transmitter module is authorized only for use in device where the antenna may be installed such that 5mm 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 [IC: 7756A-HSBT6951] 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	Hansong(Nanjing) Technology Ltd.	1.97dBi	50 Ω	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 5mm 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 5mm 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 5mm 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-HSBT6951”.

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). 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-HSBT6951 .

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 Chip 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-HSBT6951 , Contains IC: 7756A-HSBT6951 ”

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.