Wi-Fi and Bluetooth functionalities module (User Manual)

Model: STI625X
FCC ID: H8N-STI625X

Product description	Wi-Fi + BT Combo Module
Trade mark:	Askey
Model type:	STI625X
Power rating:	VBAT DC 3.3V & VDDIO DC 1.8V
Frequency range:	2.4GHz: 2.400 GHz ~ 2.4835 GHz (2.4GHz ISM Band) 5GHz: 5.15~5.35GHz、5.47~5.725GHz、5.725~5.85GHz (5GHz UNII Band)
Wi-Fi Channels:	2.4GHz: Ch1 ~ Ch11 5.15~5.35 GHz: Ch36 ~ Ch64 5.47~5.725GHz: Ch100 ~ Ch140 5.725~5.85GHz: Ch149 ~ Ch165
Antenna gain:	Antenna-1 2.4G 2400~2483 MHz 2.45 (dBi) 5G/5150~5250 MHz 4.71 (dBi) 5250~5350 MHz 4.61(dBi) 5470~5725 MHz 3.74 (dBi) 5725~5850 MHz 3.96 (dBi) Antenna-2 2.4G 2400~2483MHz 2.14 (dBi) 5G/5150~5250 MHz 3.58 (dBi) 5250~5350 MHz 3.33 (dBi) 5470~5725 MHz 4.38 (dBi) 5725~5850 MHz 5.21 (dBi)
Type of Antenna:	Dipole Antenna
HW version:	Rev-3
SW version:	DUT OS: Android 11 Driver version: 101.10.361 Firmware version: 18.35.387

Product Features

IEEE 802.11 Key Feature

- Lead Free design which is compliant with ROHS requirements.
- TX and RX low-density parity check (LDPC) support for improved range and power efficiency.

- Dual-stream spatial multiplexing up to 1200 Mbps data rate.
- 20, 40, 80 MHz channels with optional SGI (1024 QAM modulation)
- Real simultaneous dual-band
- Client MU-MIMO
- Supports standard SDIO v3.0, compatible with SDIO v2.0 HOST interfaces.

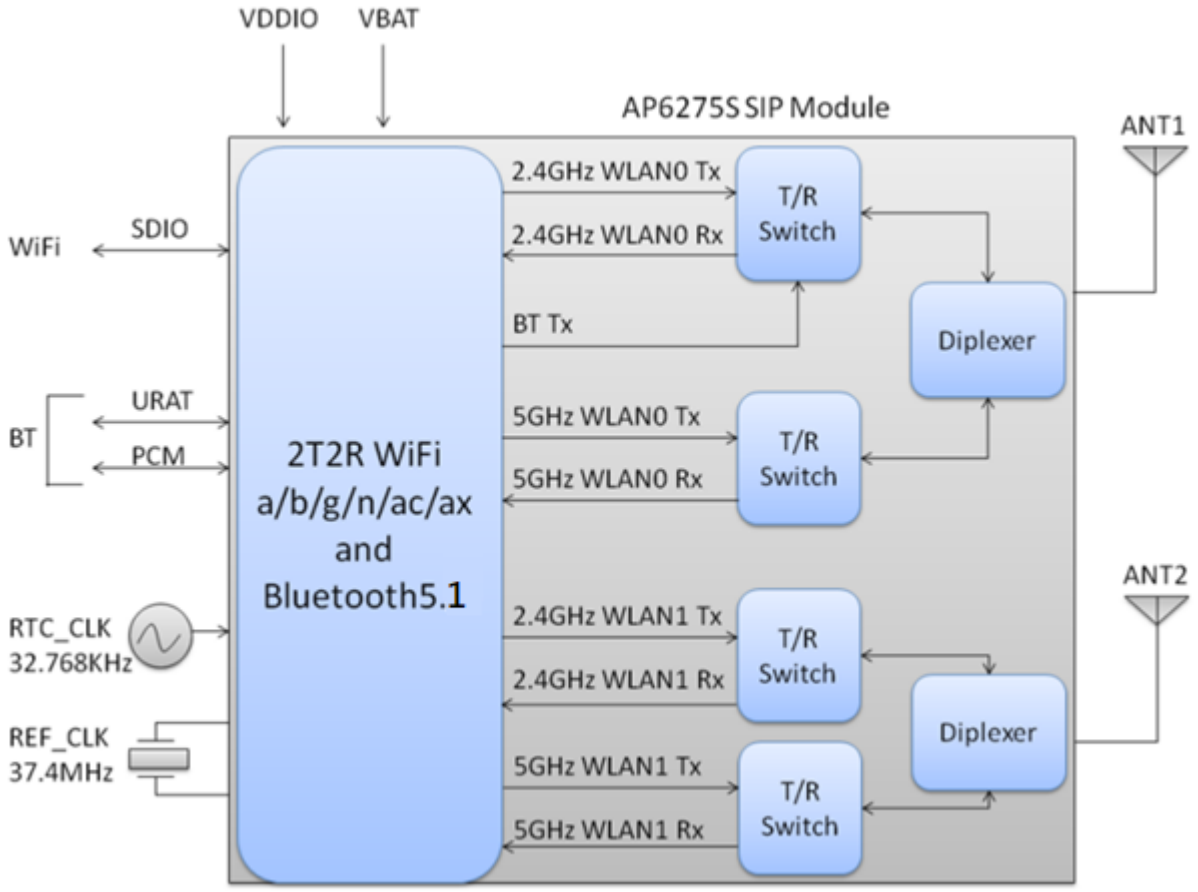
Bluetooth Key Feature

- BT host digital interface:
  - HCI UART (up to 4 Mbps)
  - PCM for audio data

- Complies with Bluetooth Core Specification Version 5.1 with provisions for supporting future specifications. With Bluetooth Class 1 or Class2 transmitter operation.

- Supports extended synchronous connections (eSCO), for enhanced voice quality by allowing for retransmission of dropped packets.

- Adaptive frequency hopping (AFH) for reducing radio frequency interference.
  A simplified block diagram of the module is depicted in the figure above.



Model Name	STI625X
Product Description	2T2R 802.11 a/b/g/n/ac/ax Wi-Fi + BT 5.1 Module
Dimension	L x W : 15 x 13 (typical) mm，H : 1.55 (Maximum) mm
WiFi Interface	Support SDIO V3.0/2.0
BT Interface	UART / PCM
Operating temperature	0°C to 40°C
Storage temperature	-40°C to 125°C
Humidity	Operating Humidity 10% to 95% Non-Condensing

Note: The optimal RF performance specified in the data sheet, however, is guaranteed only -10 °C to +55 °C and 3.2V < VBAT < 3.8V without derating performance.

RF Specification

Wi-Fi RF Specification

2.4GHz RF Specification

Conditions : VBAT=3.3V ; VDDIO=1.8V ; Temp:25°C

Feature	Description
WLAN Standard	IEEE 802.11 b/g/n/ax & Wi-Fi compliant
Frequency Range	2.400 GHz ~ 2.4835 GHz (2.4GHz ISM Band)
Number of Channels	2.4GHz ： Ch1 ~ Ch11
Modulation	802.11b : DQPSK、DBPSK、CCK 802.11g/n : OFDM /64-QAM、16-QAM、QPSK、BPSK 802.11ax : OFDMA /256-QAM、64-QAM、16-QAM、QPSK、BPSK

5GHz RF Specification

Conditions : VBAT=3.3V ; VDDIO=1.8V ; Temp:25°C

Feature	Description
WLAN Standard	IEEE 802.11a/n/ac/ax & Wi-Fi compliant
Frequency Range	5.15~5.35GHz、5.47~5.725GHz、5.725~5.85GHz (5GHz UNII Band)
Number of Channels	5.15~5.35GHz ：Ch36 ~ Ch64 5.47~5.725GHz ：Ch100 ~ Ch140 5.725~5.85GHz ：Ch149 ~ Ch165
Modulation	802.11a : OFDM /64-QAM、16-QAM、QPSK、BPSK 802.11n : OFDM /64-QAM、16-QAM、QPSK、BPSK 802.11ac : OFDM /256-QAM、64-QAM、16-QAM、QPSK、BPSK 802.11ax : OFDMA /1024-QAM、256-QAM、64-QAM、16-QAM、QPSK、BPSK

output power 2.4G:0.612W 、5G:0.111W

Bluetooth RF Specification

Conditions : VBAT=3.3V ; VDDIO=1.8V ; Temp:25°C

Feature	Description
General Specification	
Bluetooth Standard	BDR、EDR(1Mbps & 2Mbps)、LE(1Mbps)、2LE(2Mbps)
Host Interface	UART
Frequency Band	2402 MHz ~ 2480 MHz
Number of Channels	79 channels for classic、40 channels for BLE
Modulation	GFSK, π/4-DQPSK, 8DPSK
Sensitivity, tolerance ± 1.5 dB	
Sensitivity @ BER=0.1% for GFSK (1Mbps)	-88 dBm
Sensitivity @ BER=0.01% for π/4-DQPSK (2Mbps)	-91 dBm
Sensitivity @ BER=0.01% for 8DPSK (3Mbps)	-85 dBm
Sensitivity @ PER=30.8% for LE (1Mbps)	-90 dBm
Sensitivity @ PER=30.8% for 2LE (2Mbps)	-91dBm
Maximum Input Level	GFSK (1Mbps):-20dBm
	π/4-DQPSK (2Mbps) :-20dBm
	8DPSK (3Mbps) :-20dBm

Note*：The Bluetooth BDR output power is able to be configured by firmware (hcd file).

output power BT(8DPSK):0.00998W， LE(GFSK):0.00690W

External clock reference

External LPO signal characteristics

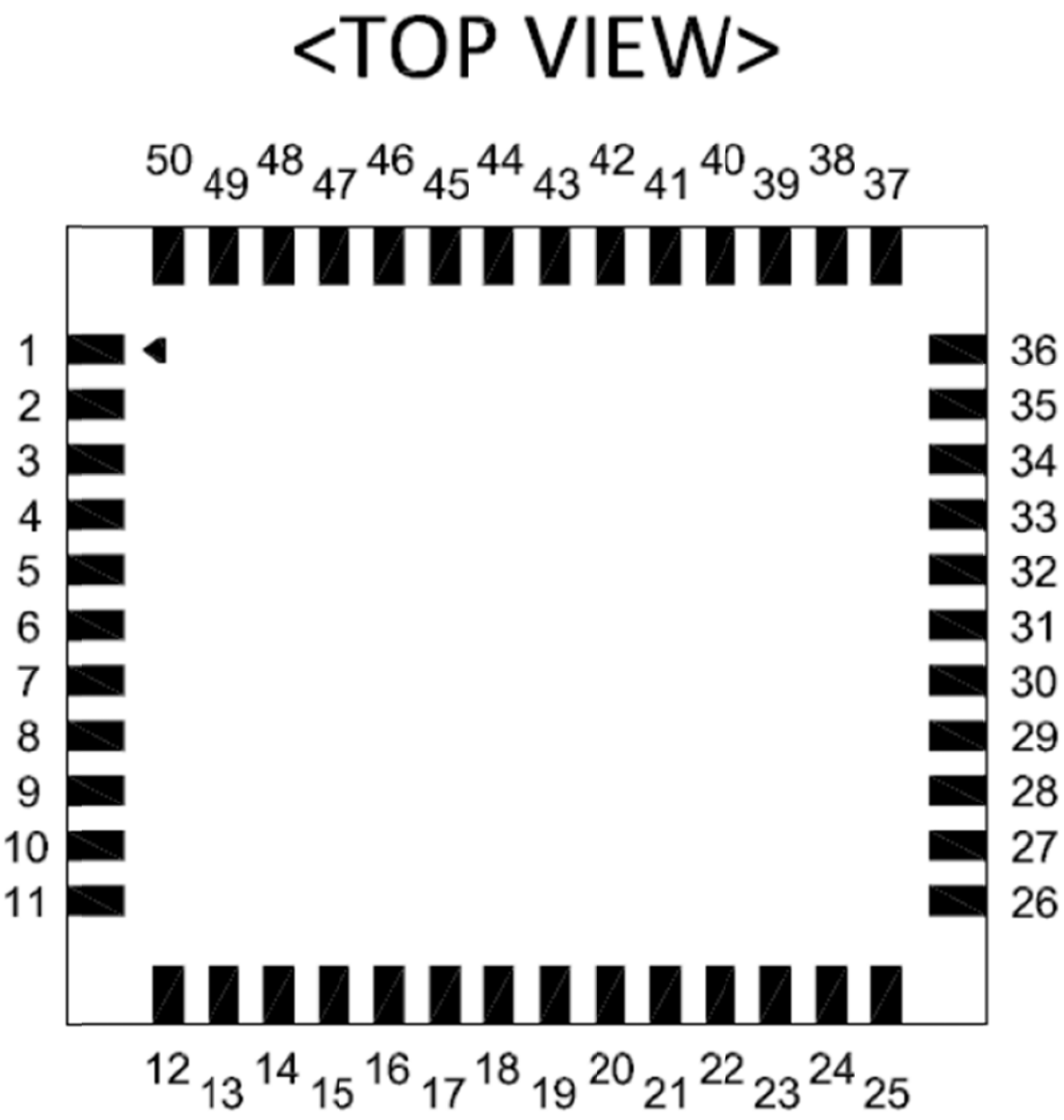
Parameter	Specification	Units
Nominal input frequency	32.768	kHz
Frequency accuracy	+/-25	ppm
Duty cycle	30 - 70	%
Input signal amplitude	1.8±0.09	V
Signal type	Square-wave or sine-wave	-
Input impedance	>100k <5	Ω pF
Clock jitter (integrated over 300Hz – 15KHz)	<1	Hz
Output high voltage	0.7Vio - Vio	V

External 37.4MHz X'TAL characteristics

Parameter	Specification	Units
Nominal frequency - F0	37.4	MHz
Frequency Tolerance - Δ F / F 0 (At 25℃ +/- 3℃)	+/- 10	ppm
Operation Temperature Range - Topr	-30 ~ + 85	℃
Freq. Stability(over operating temperature) - TC Ref. to 25℃	+/- 10	ppm
Load capacitance - CL	18	pF
Equivalent Series Resistance – ESR	Max. 60	Ω
Drive Level - DL	Typ. 50, Max. 100	uW
Insulation resistance – IR At 100Vdc	Min. 500	MΩ

Pin Definition

Pin outline

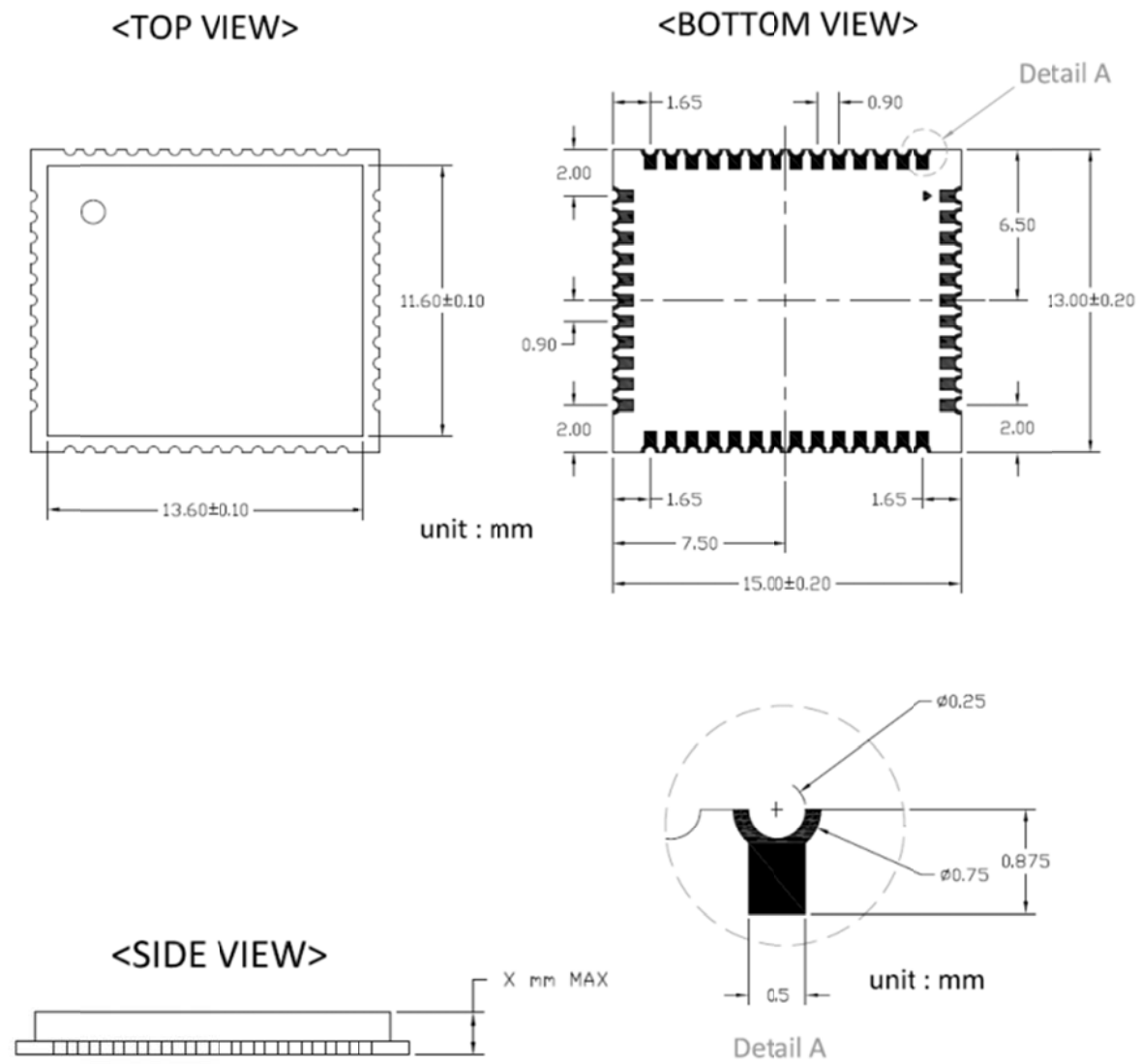


Pin Assignment

NO	Name	Type	Description
1	GND	—	Ground connections
2	WL_ANT0	I/O	RF I/O port0
3	GND	—	Ground connections
4	GND	—	Ground connections
5	GND	—	Ground connections
6	GND	—	Ground connections
7	GND	—	Ground connections
8	GND	—	Ground connections
9	WL_ANT1	I/O	RF I/O port1
10	GND	—	Ground connections
11	GND	—	Ground connections
12	NC	—	Floating (Don't connected to ground)
13	XTAL_IN	I	External Crystal in/ Single clock source in
14	XTAL_OUT	O	External Crystal out
15	WL_REG_ON	I	Low asserting reset for WiFi core
16	WL_HOST_WAKE/WL_GPIO_0	O	WLAN to wake-up HOST and WL_GPIO_0
17	SDIO_DATA_CMD	I/O	SDIO command line
18	SDIO_DATA_CLK	I/O	SDIO clock line
19	SDIO_DATA_3	I/O	SDIO data line 3
20	SDIO_DATA_2	I/O	SDIO data line 2
21	SDIO_DATA_0	I/O	SDIO data line 0
22	SDIO_DATA_1	I/O	SDIO data line 1
23	GND	—	Ground connections
24	NC	—	Floating (Don't connected to ground)
25	CBUCK_0P9	I	Internal Buck voltage generation pin
26	CSR_VLX	O	Internal Buck voltage generation pin
27	GND	—	Ground connections
28	ASR_VLX	O	Internal Analog Buck voltage generation pin
29	ABUCK_1P12	I	Internal Analog Buck voltage generation pin
30	GND	—	Ground connections
31	LPO	I	External Low Power Clock input (32.768KHz)
32	GND	—	Ground connections
33	WL_GPIO_10	I/O	WL_GPIO_10
34	VDDIO	P	I/O Voltage supply input

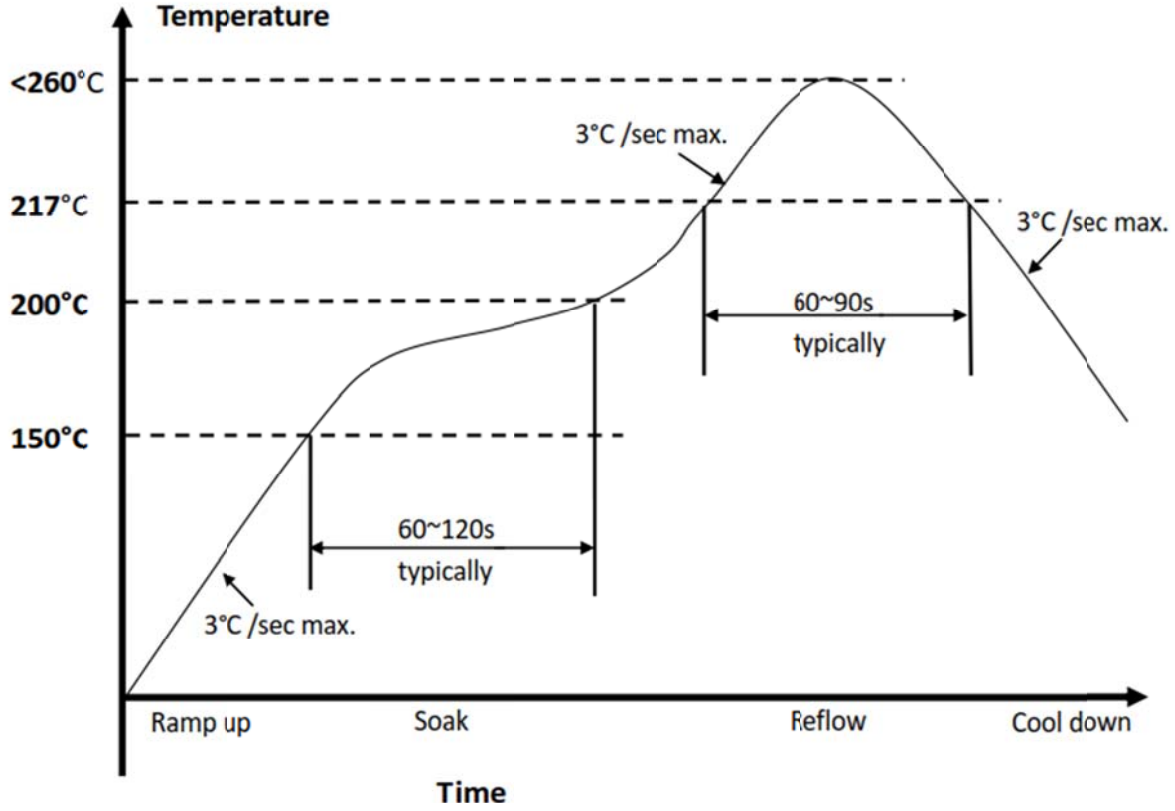
35	WL_GPIO_11	I/O	WL_GPIO_11
36	VBAT	P	Main power voltage source input
37	NC	—	Floating (Don't connected to ground)
38	BT_REG_ON	I	Low asserting reset for Bluetooth core
39	GND	—	Ground connections
40	BT_UART_TXD	O	Bluetooth UART interface
41	BT_UART_RXD	I	Bluetooth UART interface
42	BT_UART_RTS_N	O	Bluetooth UART interface
43	BT_UART_CTS_N	I	Bluetooth UART interface
44	BT_PCM_CLK	I/O	BT PCM CLK; can be master (output) or slave (input)
45	BT_PCM_SYNC	I/O	BT PCM sync ; can be master (output) or slave (input)
46	BT_PCM_IN	I	BT PCM data input
47	BT_PCM_OUT	O	BT PCM data output
48	NC	—	NC
49	BT_WAKE	I	HOST wake-up Bluetooth device
50	BT_HOST_WAKE	O	Bluetooth device to wake-up HOST

Dimensions



Note, X = 1.55mm

Recommended Reflow Profile



1. Referred to IPC/JEDEC standard
2. Peak Temperature : <260°C(Time within 5°C of actual Peak Temperature 20-40 seconds)
3. Cycle of Reflow : 2 times max.
4. Adding Nitrogen (N2) to implement 2000ppm or less of oxygen concentration during reflow process is recommended.
5. If the shelf time is exceeded, be sure baking step to remove the moisture from the component

FCC Compliance Statement

FCC ID: H8N-STI625X

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.

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.

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

Note: The manufacturer is not responsible for any radio or TV interference caused by unauthorized modifications to this equipment. Such modifications could void the user's authority to operate the equipment.

FCC RF Radiation Exposure Statement:

This equipment complies with FCC RF radiation exposure limits set forth for an uncontrolled environment.
This device and its antenna must not be co-located or operating in conjunction with any other antenna or transmitter.
“To comply with FCC RF exposure compliance requirements, this grant is applicable to only Mobile Configurations. The antennas used for this transmitter must be installed to provide a separation Distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.”

Notice to OEM integrator
Must use the device only in host devices that meet the FCC/ISED RF exposure category of mobile, which means the device is installed and used at distances of at least 20cm from persons. The end user manual shall include FCC Part 15 /ISED RSS GEN compliance statements related to the transmitter as show in this manual.

Host manufacturer is responsible for compliance of the host system with module installed with all other applicable requirements for the system such as Part 15 B, ICES 003. Host manufacturer is strongly recommended to confirm compliance with FCC/ISED requirements for the transmitter when the module is installed in the host.
Must have on the host device a label showing Contains FCC ID: H8N-STI625X