

S6652P2-T

IEEE 802.11a/b/g/n/ac/ax 2T2R+Bluetooth 5.4 Combo Module

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1. Device Overview

1.1 Descriptions

The S6652P2-T is a highly integrated module that supports 2T2R 802.11 a/b/g/n/ac/ax with Wireless LAN (WLAN) PCIe interface controller and Bluetooth 5.4. It combined with BPSK, QPSK, 16QAM, 64QAM, 256QAM and up to 1024QAM modulation of the individual subcarriers, and compatible coding rate of 1/2, 2/3, 3/4, 5/6, provide up to 1201Mbps for IEEE 802.11ax MIMO OFDM. In addition, this compact module is a total solution for a combination of Wi-Fi + BT technologies. The module is specifically developed for tablet, OTT box and portable devices.

1.2 Features

1.2.1 General Features

- Supports VBAT range from 3.0V to 3.6V
- Supports WPA,WPA2,WPA3,WAPI
- Supports WOW
- Supports TCP/UDP checksum offload
- Package:LGA-50Pin.15.0mm*13.0mm

1.2.2 Wi-Fi Key Features

- IEEE 802.11 a/b/g/n/ac/ax (supports wave-2)
- Supports IEEE 802.11 d/e/h/i/k/mc/r/v/w
- Dual-stream spatial multiplexing data rate of up to 1200 Mbps
- Supports multiple single-mode operation modes such as Wi Fi STA, AP, P2P, TDLS
- Supports multi-mode coexistence modes such as DBDC and DBSC
- Supports 2G 40MHz bandwidth, 5G 80MHz bandwidth, 6G 80MHz bandwidth
- Supports two antennas
- Supports up to 1024QAM modulation, supports LDPC, STBC
- Supports UL/DL OFDMA、 Supports UL/DL MU-MIMO
- Supports QoS, Supports WFA WMM, WMM PS
- Supports RSSI and CSI reporting
- Supports as a Beamformer, supporting 2x2/2x1 Tx Beamforming
- Supports as a Beamformee and supports 4X2 Tx Beamforming
- Supports features such as BSS Color and Spatial Reuse to improve air port utilization
- Supports TWT
- Supports high-precision indoor positioning function

- Supports standard PCIe interface.

1.2.3 Bluetooth Key Features

- Supports Bluetooth (BT+BLE) v2.1、v3.0、v4.2、v5.4
- Supports PCIe interface for BT data transmission
- Supports PCM/I2S interface for audio data transfer, supports VOHCI
- Supports BR/EDR/LE 1M/LE 2M/LE LR
- Supports SCO and eSCO links
- Supports low power mode (sniff、sniff sub-rating)
- Supports AOA/AOD
- Supports LE Audio

2. Pin Configuration and Functions

2.1 Module Pin Diagram

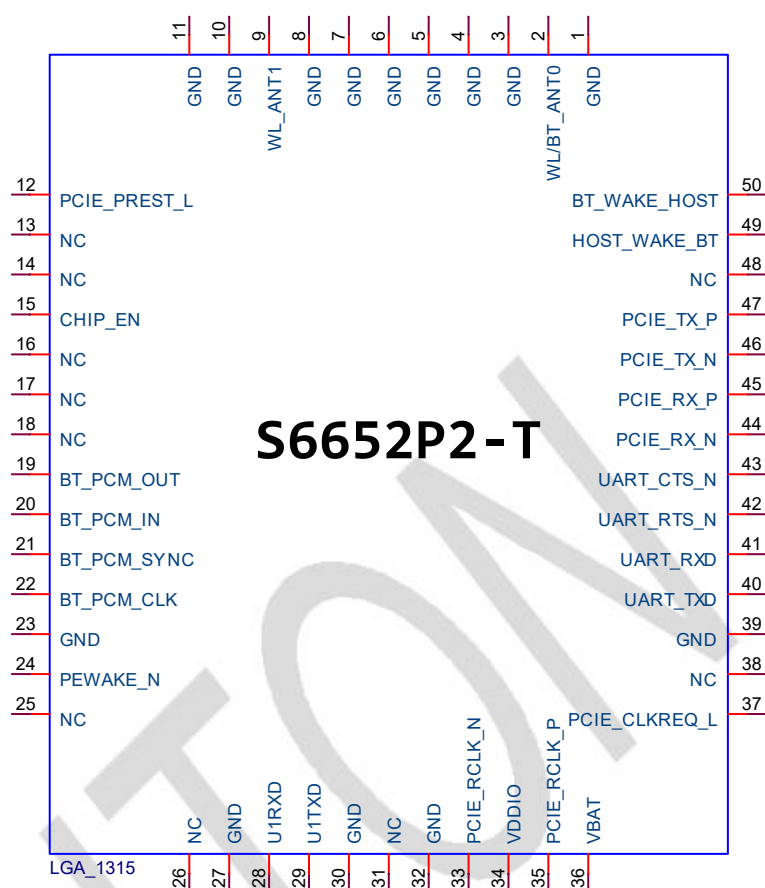


Figure 2.Pin Diagram of S6652P2-T

2.2 Pin Functions

Pin	Name	Description
1	GND	Ground
2	WL/BT_ANT0	RF input/output of path DIV WLAN and BT
3	GND	Ground
4	GND	Ground
5	GND	Ground
6	GND	Ground
7	GND	Ground
8	GND	Ground

9	WL_ANT1	RF input/output of path PRI WLAN
10	GND	Ground
11	GND	Ground
12	PCIE_PREST_L	RC reset EP
13	NC	No connect, keep floating
14	NC	No connect, keep floating
15	CHIP_EN	Chip enable.
16	NC	No connect, keep floating
17	NC	No connect, keep floating
18	NC	No connect, keep floating
19	BT_PCM_OUT	PCM data output
20	BT_PCM_IN	PCM data input
21	BT_PCM_SYNC	PCM sync signal
22	BT_PCM_CLK	PCM clock
23	GND	Ground
24	PEWAKE_N	EP wake up RC
25	NC	No connect, keep floating
26	NC	No connect, keep floating
27	GND	Ground
28	U1RXD	UART1 RXD,just for test on PC.
29	U1TXD	UART1 TXD,just for test on PC.
30	GND	Ground
31	NC	No connect, keep floating
32	GND	Ground
33	PCIE_RCLK_N	PCI Express differential clock input-Negative
34	VDDIO	Digital/Bluetooth/SDIO/ I/O Voltage
35	PCIE_RCLK_P	PCI Express differential clock input-Positive
36	VBAT	Power supply Voltage
37	PCIE_CLKREQ_L	PCIe clock request
38	NC	No connect, keep floating
39	GND	Ground

40	UART_TXD	High-Speed UART Data Out
41	UART_RXD	High-Speed UART Data In
42	UART_RTS_N	High-Speed UART RTS
43	UART_CTS_N	High-Speed UART CTS
44	PCIE_RX_N	PCI Express receive data-Negative
45	PCIE_RX_P	PCI Express receive data-Positive
46	PCIE_TX_N	PCI Express transmit data-Negative
47	PCIE_TX_P	PCI Express transmit data-Positive
48	NC	No connect, keep floating
49	HOST_WAKE_BT	Host wake up BT
50	BT_WAKE_HOST	BT wake up Host

3. Specifications

3.1 General Characteristics

Category	Descriptions
Dimension	L*W*H :15.0mm (±0.2mm)*13.0mm (±0.2mm)*1.6mm (±0.1mm)
Chip-set	SWT6652-A
Standard	IEEE 802.11a/b/g/n/ac/ax+BT 5.4
Modulation Type	CCK, DBPSK, DQPSK, OFDM, OFDMA
Frequency Band	2400~2500MHz,4900-7115MHz
Interface	WLAN: PCIe, Bluetooth: PCIe
Data Security	WPA,WPA2,WPA3,WAPI
Transmit Power	2.4G: 11b 11M:20dBm±2dBm 11g 54M: 17dBm±2dBm 11n HT20 MCS7: 16dBm±2dBm 11n HT40 MCS7: 16dBm±2dBm 11ax HE20 MCS11: 15dBm±2dBm 11ax HE40 MCS11: 15dBm±2dBm 5G: 11a 54M: 17dBm±2dBm 11n HT20 MCS7: 16dBm±2dBm 11n HT40 MCS7: 16dBm±2dBm 11ac VHT20 MCS8: 15dBm±2dBm 11ac VHT40 MCS9: 15dBm±2dBm 11ac VHT80 MCS9: 15dBm±2dBm 11ax HE20 MCS11: 13dBm±2dBm 11ax HE40 MCS11: 13dBm±2dBm 11ax HE80 MCS11: 11dBm±2dBm
Rx Sensitivity	2.4G: 11b 11M: -89dBm @8% PER 11g 54M: -76dBm @10% PER 11n HT20 MCS7: -73 dBm @10% PER 11ax HE20 MCS9: -72 dBm @10% PER 5G: 11a 54M: -76 dBm @10% PER 11n HT20 MCS7: -73 dBm @10% PER

	11n HT40 MCS7: -72 dBm @10% PER 11ac VTH20 MCS8: -68 dBm @10% PER 11ac VTH40 MCS9: -64 dBm @10% PER 11ac VTH80 MCS9: -61 dBm @10% PER 11ax HE20 MCS11: -62 dBm @10% PER 11ax HE40 MCS11: -60 dBm @10% PER 11ax HE80 MCS11: -57 dBm @10% PER
Data Rate	802.11b [11,5.5,2 and 1Mbps] 802.11g [54,48,36,24,18,12,9&6Mbps] 802.11n HT20:up to 144.4Mbps 802.11n HT40:up to 300Mbps 802.11ac VHT80:up to 866.7Mbps 802.11ax HE20:up to 286.8Mbps 802.11ax HE40:up to 573.6Mbps 802.11ax HE80:up to 1201Mbps
Frequency Error	2.4/5/6GHz:<±20 ppm
Ambient Temperature	-30℃~70℃
Storage Temperature	-40℃~85℃
Storage Humidity	Less than 60%
Antenna	External antenna
Operating System	Linux,Android
Operating Voltage	VBAT:3.0V~3.6V(Typical:3.3V) VDDIO:1.62V~1.92V(Typical:1.8V) or 3.0V~3.6V(Typical:3.3V)

3.2 RF Characteristics

All measurements are made under nominal supply voltage, room temperature and conducted conditions at each antenna port rather than antenna.

3.2.1 Receiver RF Specifications

Parameter	Conditions		Min.	Nom.	Max.	Unit
Receive input frequency	802.11b/g/n/ax mode		2400	-	2500	MHz
Receiver sensitivity						
802.11b	1Mbps	FER<8%, Packet size= 1,024bytes	-	-	-82	dBm
	2Mbps		-	-	-80	dBm
	5.5Mbps		-	-	-78	dBm

	11Mbps		-	-	-76	dBm
802.11g	6Mbps	PER<10%, Packet size= 1,024bytes	-	-	-82	dBm
	9Mbps		-	-	-81	dBm
	12Mbps		-	-	-79	dBm
	18Mbps		-	-	-77	dBm
	24Mbps		-	-	-74	dBm
	36Mbps		-	-	-70	dBm
	48Mbps		-	-	-66	dBm
	54Mbps		-	-	-65	dBm
802.11n (HT20)	MCS0.	PER<10%, Packet size= 4,096bytes	-	-	-82	dBm
	MCS1.		-	-	-79	dBm
	MCS2		-	-	-77	dBm
	MCS3.		-	-	-74	dBm
	MCS4.		-	-	-70	dBm
	MCS5.		-	-	-66	dBm
	MCS6.		-	-	-65	dBm
	MCS7.		-	-	-64	dBm
802.11n (HT40)	MCS0.	PER<10%, Packet size= 4,096bytes	-	-	-79	dBm
	MCS1.		-	-	-77	dBm
	MCS2		-	-	-74	dBm
	MCS3.		-	-	-71	dBm
	MCS4.		-	-	-67	dBm
	MCS5.		-	-	-63	dBm
	MCS6.		-	-	-62	dBm
	MCS7.		-	-	-61	dBm
802.11ax (HE20)	MCS0.	PER<10%, Packet size= 4,096bytes	-	-	-82	dBm
	MCS1.		-	-	-79	dBm
	MCS2		-	-	-77	dBm
	MCS3.		-	-	-74	dBm
	MCS4.		-	-	-70	dBm
	MCS5.		-	-	-66	dBm
	MCS6.		-	-	-65	dBm
	MCS7.		-	-	-64	dBm
	MCS8.		-	-	-59	dBm
	MCS9.		-	-	-57	dBm
	MCS10.		-	-	-54	dBm

	MCS11.		-	-	-52	dBm
802.11ax (HE40)	MCS0.	PER<10%, Packet size= 4,096bytes	-	-	-79	dBm
	MCS1.		-	-	-76	dBm
	MCS2		-	-	-74	dBm
	MCS3.		-	-	-71	dBm
	MCS4.		-	-	-67	dBm
	MCS5.		-	-	-63	dBm
	MCS6.		-	-	-62	dBm
	MCS7.		-	-	-61	dBm
	MCS8.		-	-	-56	dBm
	MCS9.		-	-	-54	dBm
	MCS10.		-	-	-51	dBm
	MCS11.		-	-	-49	dBm
Maximum input level						
802.11b	FER<8%		-10	-	-	dBm
802.11g	FER<10%		-20	-	-	dBm
802.11n	FER<10%		-30			dBm
802.11ax	FER<10%		-20			dBm

Parameter	Conditions		Min.	Nom.	Max.	Unit
Receive input frequency	802.11a/n/ac/ax mode		4900	-	7115	MHz
Receiver sensitivity						
802.11a	6Mbps	FER<10%, Packet size= 1,024bytes	-	-	-82	dBm
	9Mbps		-	-	-81	dBm
	12Mbps		-	-	-79	dBm
	18Mbps		-	-	-77	dBm
	24Mbps		-	-	-74	dBm
	36Mbps		-	-	-70	dBm
	48Mbps		-	-	-66	dBm
	54Mbps		-	-	-65	dBm
802.11n (HT20)	6Mbps	PER<10%, Packet size= 4,096bytes	-	-	-82	dBm
	9Mbps		-	-	-79	dBm
	12Mbps		-	-	-77	dBm
	18Mbps		-	-	-74	dBm
	24Mbps		-	-	-70	dBm
	36Mbps		-	-	-66	dBm

	48Mbps		-	-	-65	dBm
	54Mbps		-	-	-64	dBm
802.11n (HT40)	MCS0.	PER<10%, Packet size= 4,096bytes	-	-	-79	dBm
	MCS1.		-	-	-77	dBm
	MCS2		-	-	-74	dBm
	MCS3.		-	-	-71	dBm
	MCS4.		-	-	-67	dBm
	MCS5.		-	-	-63	dBm
	MCS6.		-	-	-62	dBm
	MCS7.		-	-	-61	dBm
802.11ac (VHT80)	MCS0.	PER<10%, Packet size= 4,096bytes	-	-	-76	dBm
	MCS1.		-	-	-73	dBm
	MCS2		-	-	-71	dBm
	MCS3.		-	-	-68	dBm
	MCS4.		-	-	-64	dBm
	MCS5.		-	-	-60	dBm
	MCS6.		-	-	-59	dBm
	MCS7.		-	-	-58	dBm
	MCS8.		-	-	-53	dBm
	MCS9.		-	-	-51	dBm
802.11ax (HE80)	MCS0.	PER<10%, Packet size= 4,096bytes	-	-	-76	dBm
	MCS1.		-	-	-73	dBm
	MCS2		-	-	-71	dBm
	MCS3.		-	-	-68	dBm
	MCS4.		-	-	-64	dBm
	MCS5.		-	-	-60	dBm
	MCS6.		-	-	-59	dBm
	MCS7.		-	-	-58	dBm
	MCS8.		-	-	-53	dBm
	MCS9.		-	-	-51	dBm
	MCS10.		-	-	-48	dBm
	MCS11.		-	-	-46	dBm
Maximum input level						
802.11a	FER<10%		-30	-	-	dBm
802.11n	FER<10%		-30	-	-	dBm
802.11ac	FER<10%		-30	-	-	dBm

802.11ax	FER<10%		-30	-	-	dBm
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3.2.2 Transmitter RF Specifications

Parameter	Condition	Min.	Nom.	Max.	Unit.
802.11b/g/n/ax frequency	2.4GHz	2400	-	2500	MHz
Transmit power					
802.11b	11Mbps	18	20	22	dBm
802.11g	54Mbps	15	17	19	dBm
802.11n	HT20, MCS7	14	16	18	dBm
	HT40, MCS7	14	16	18	dBm
802.11ax	HE20,MCS11	13	15	17	dBm
	HE40,MCS11	13	15	17	dBm
Spectrum mask					
802.11b	$f_c-22\text{MHz}<f<f_c-11\text{MHz}&f_c+11\text{MHz}<f<f_c+22\text{MHz}$	-	-	-30	dBr
	$f_c-55\text{MHz}<f<f_c-22\text{MHz}&f_c+22\text{MHz}<f<f_c+55\text{MHz}$	-	-	-50	dBr
802.11g	$f_c\pm 9\text{MHz}$	-	-	0	dBr
	$f_c\pm 11\text{MHz}$	-	-	-20	dBr
	$f_c\pm 20\text{MHz}$	-	-	-28	dBr
	$f_c\pm 30\text{MHz}$	-	-	-40	dBr
802.11n	$f_c\pm 9\text{MHz}$	-	-	0	dBr
	$f_c\pm 11\text{MHz}$	-	-	-20	dBr
	$f_c\pm 20\text{MHz}$	-	-	-28	dBr
	$f_c\pm 30\text{MHz}$	-	-	-45	dBr
802.11ax (HE20)	$f_c\pm 9.75\text{MHz}$	-	-	0	dBr
	$f_c\pm 10.5\text{MHz}$	-	-	-20	dBr
	$f_c\pm 20\text{MHz}$	-	-	-28	dBr
	$f_c\pm 30\text{MHz}$	-	-	-40	dBr
802.11ax (HE40)	$f_c\pm 19.5\text{MHz}$	-	-	0	dBr
	$f_c\pm 20.5\text{MHz}$	-	-	-20	dBr
	$f_c\pm 40\text{MHz}$	-	-	-28	dBr
	$f_c\pm 60\text{MHz}$	-	-	-40	dBr
Center frequency tolerance					
802.11b		-20	-	+20	ppm

802.11g/n/ax		-20	-	+20	ppm
EVM (Error Vector Magnitude)*					
802.11b	1Mbps	-	-	35	%
	2Mbps	-	-	35	%
	5.5Mbps	-	-	35	%
	11Mbps	-	-	35	%
802.11g	6Mbps	-	-	-5	%
	9Mbps	-	-	-8	dB
	12Mbps	-	-	-10	dB
	18Mbps	-	-	-13	dB
	24Mbps	-	-	-16	dB
	36Mbps	-	-	-19	dB
	48Mbps	-	-	-22	dB
	54Mbps	-	-	-25	dB
802.11n	MCS0.	-	-	-5	dB
	MCS1.	-	-	-10	dB
	MCS2	-	-	-13	dB
	MCS3.	-	-	-16	dB
	MCS4.	-	-	-19	dB
	MCS5.	-	-	-22	dB
	MCS6.	-	-	-25	dB
	MCS7.	-	-	-28	dB
802.11ax	MCS0.	-	-	-5	dB
	MCS1.	-	-	-10	dB
	MCS2	-	-	-13	dB
	MCS3.	-	-	-16	dB
	MCS4.	-	-	-19	dB
	MCS5.	-	-	-22	dB
	MCS6.	-	-	-25	dB
	MCS7.	-	-	-27	dB
	MCS8.	-	-	-30	dB
	MCS9.	-	-	-32	dB
	MCS10.	-	-	-35	dB
	MCS11.	-	-	-35	dB

Parameter	Condition	Min.	Nom.	Max.	Unit.
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802.11a/n/ac/ax frequency	5/6GHz	4900	-	7115	MHz
Transmit power					
802.11a	54Mbps	15	17	19	dBm
802.11n	HT20, MCS7	14	16	18	dBm
	HT40, MCS7	14	16	18	dBm
802.11ac	VHT20,MCS8	13	15	17	dBm
	VHT40,MCS9	13	15	17	dBm
	VHT80,MCS9	13	15	17	dBm
802.11ax	HE20,MCS11	11	13	15	dBm
	HE40,MCS11	11	13	15	dBm
	HE80,MCS11	9	11	13	dBm
Spectrum mask					
802.11a	$f_c \pm 9\text{MHz}$	-	-	0	dBr
	$f_c \pm 11\text{MHz}$	-	-	-20	dBr
	$f_c \pm 20\text{MHz}$	-	-	-28	dBr
	$f_c \pm 30\text{MHz}$	-	-	-40	dBr
802.11n	$f_c \pm 9\text{MHz}$	-	-	0	dBr
	$f_c \pm 11\text{MHz}$	-	-	-20	dBr
	$f_c \pm 20\text{MHz}$	-	-	-28	dBr
	$f_c \pm 30\text{MHz}$	-	-	-45	dBr
802.11ac (VHT80)	$f_c \pm 39\text{MHz}$	-	-	0	dBr
	$f_c \pm 41\text{MHz}$	-	-	-20	dBr
	$f_c \pm 80\text{MHz}$	-	-	-28	dBr
	$f_c \pm 120\text{MHz}$	-	-	-40	dBr
802.11ax (HE80)	$f_c \pm 39.5\text{MHz}$	-	-	0	dBr
	$f_c \pm 40.5\text{MHz}$	-	-	-20	dBr
	$f_c \pm 80\text{MHz}$	-	-	-28	dBr
	$f_c \pm 120\text{MHz}$	-	-	-40	dBr
Center frequency tolerance					
802.11a/n/ac/ax		-20	-	+20	ppm
EVM (Error Vector Magnitude)*					
802.11a	6Mbps	-	-	-5	%
	9Mbps	-	-	-8	dB
	12Mbps	-	-	-10	dB
	18Mbps	-	-	-13	dB
	24Mbps	-	-	-16	dB

	36Mbps	-	-	-19	dB
	48Mbps	-	-	-22	dB
	54Mbps	-	-	-25	dB
802.11n	MCS0.	-	-	-5	dB
	MCS1.	-	-	-10	dB
	MCS2	-	-	-13	dB
	MCS3.	-	-	-16	dB
	MCS4.	-	-	-19	dB
	MCS5.	-	-	-22	dB
	MCS6.	-	-	-25	dB
	MCS7.	-	-	-28	dB
802.11ac	MCS0.	-	-	-5	dB
	MCS1.	-	-	-10	dB
	MCS2	-	-	-13	dB
	MCS3.	-	-	-16	dB
	MCS4.	-	-	-19	dB
	MCS5.	-	-	-22	dB
	MCS6.	-	-	-25	dB
	MCS7.	-	-	-27	dB
	MCS8.	-	-	-30	dB
	MCS9.	-	-	-32	dB
802.11ax	MCS0.	-	-	-5	dB
	MCS1.	-	-	-10	dB
	MCS2	-	-	-13	dB
	MCS3.	-	-	-16	dB
	MCS4.	-	-	-19	dB
	MCS5.	-	-	-22	dB
	MCS6.	-	-	-25	dB
	MCS7.	-	-	-27	dB
	MCS8.	-	-	-30	dB
	MCS9.	-	-	-32	dB
	MCS10.	-	-	-35	dB
	MCS11.	-	-	-35	dB

3.2.3 Bluetooth RF Specifications

Parameter	Conditions	Minimum	Typical	Maximum	Unit
Frequency range		2402		2480	MHz
RX sensitivity	Sensitivity@BER=0.1% for GFSK(1Mbps)	-	-94	-	dBm
	Sensitivity@BER=0.01% for $\pi/4$ -DQPSK(2Mbps)	-	-92	-	dBm
	Sensitivity@BER=0.01% for 8DPSK (3Mbps)	-	-87	-	dBm
	Sensitivity@PER=30.8% for LE (1Mbps)	-	-97	-	dBm
	Sensitivity@PER=30.8% for 2LE (2Mbps)	-	-94	-	dBm
Output power	BDR	-	10	-	dBm
	EDR	-	10	-	dBm
	BLE	-	10	-	dBm

3.3 DC Characteristics

3.3.1 Absolute Maximum Ratings

Symbol	Description	Value	Unit
VBAT	Power supply Voltage	-0.5 to +5.25	V
VDDIO	Digital/Bluetooth/SDIO/ I/O Voltage	-0.5 to +5.25	V

3.3.2 Recommended Operating Conditions and DC Characteristics

Symbol	Value			Unit
	Min	Typ	Max	
VBAT	3.0	3.3	3.6	V
VDDIO	1.62	1.8	1.92	V
	3.0	3.3	3.6	V

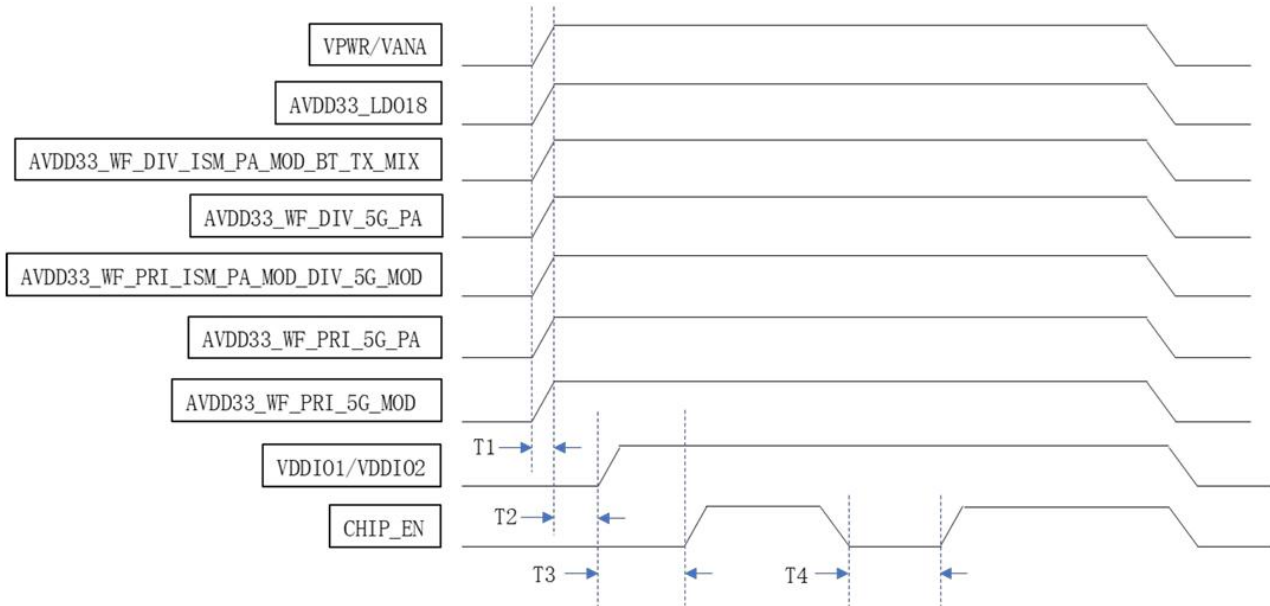
The module requires two power supplies: VBAT and VDDIO.

3.3.3 Working current level

Symbol	Min	Typ	Max	Unit
--------	-----	-----	-----	------

VBAT	-	1000	1500	mA
VDDIO	-	-	100	mA

3.4 Power on/off and Reset timing



	Description	Min	Type	Max
T1	3.3V Ramp up time	200us	500us	-
T2	VDDIO1/VDDIO2 should be powered on after 3.3V is powered on	0	-	-
T3	CHIP_EN should be powered on after VDDIO1/VDDIO2 is powered on	0	-	-
T4	CHIP_EN reset time	50ms	-	-

4. Application and Implementation

4.1 Application Diagram

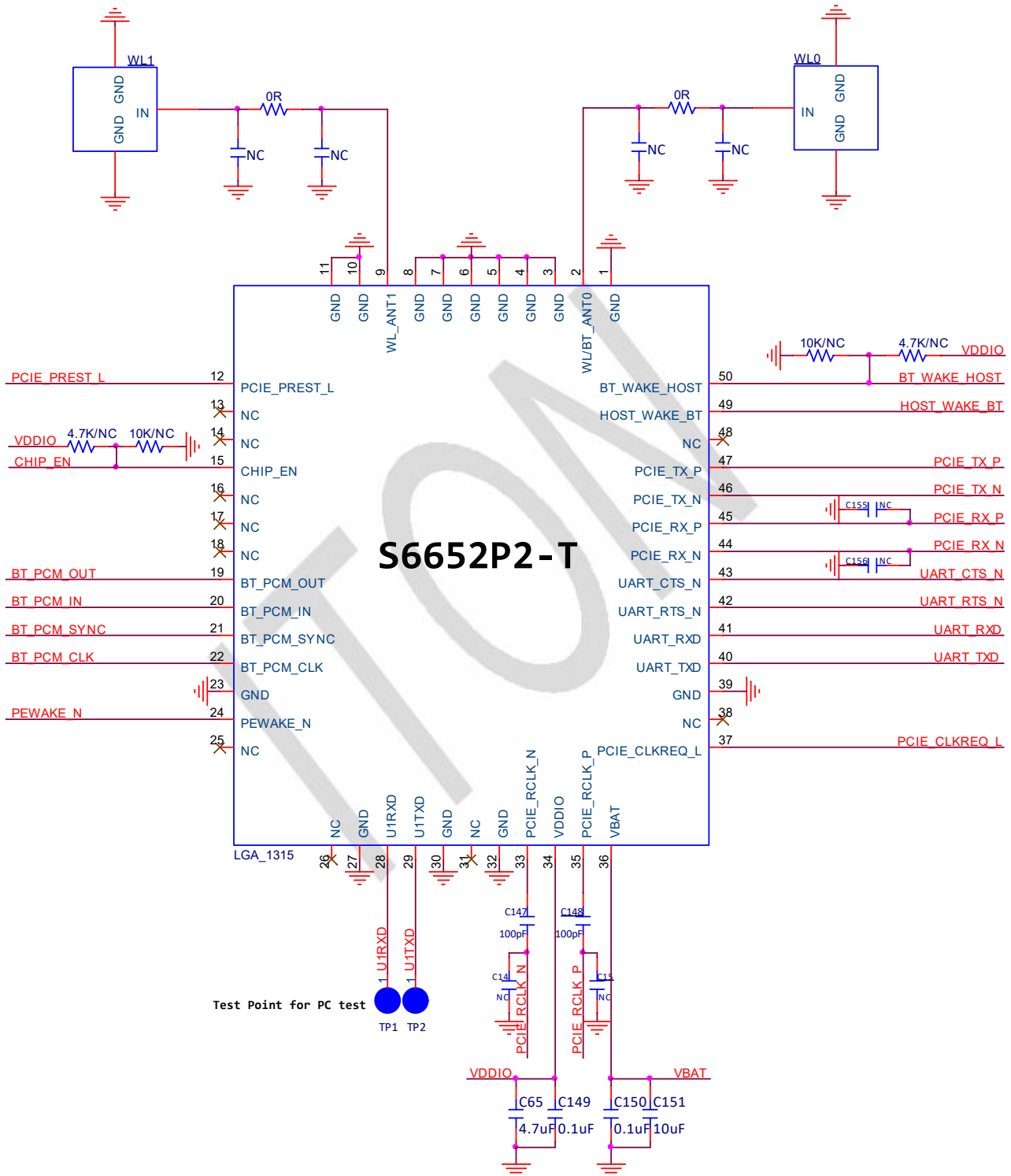


Figure 3. Application Schematic Diagram of S6652P2-T

5. Mechanical and Package

5.1 Mechanical Size

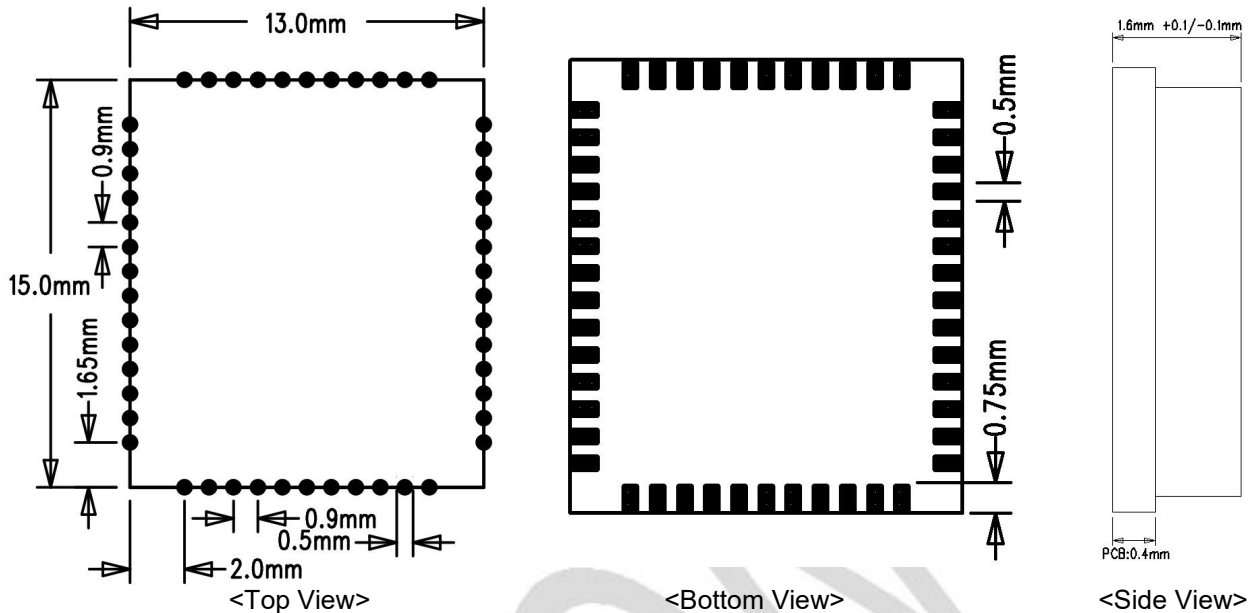


Figure 4. Mechanical Size of S6652P2-T

5.2 Recommended Land Pattern

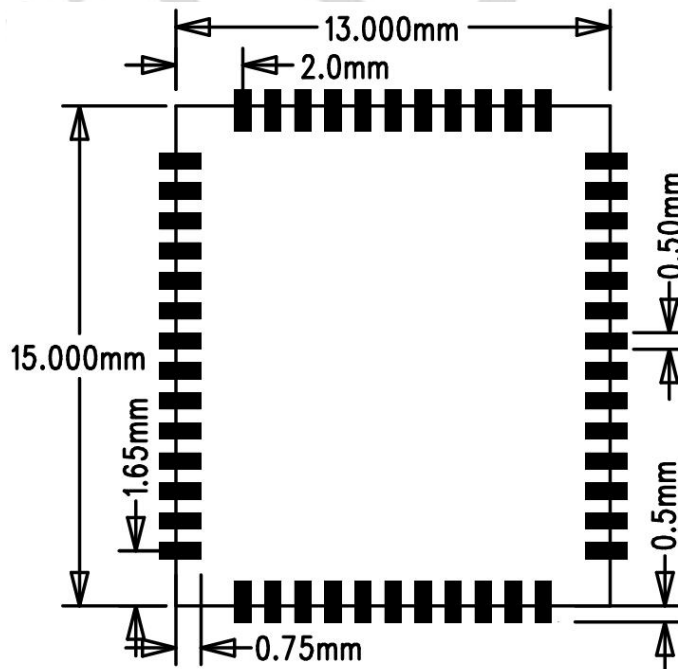


Figure 5. Recommended Land Pattern of S6652P2-T

5.3 Package Information

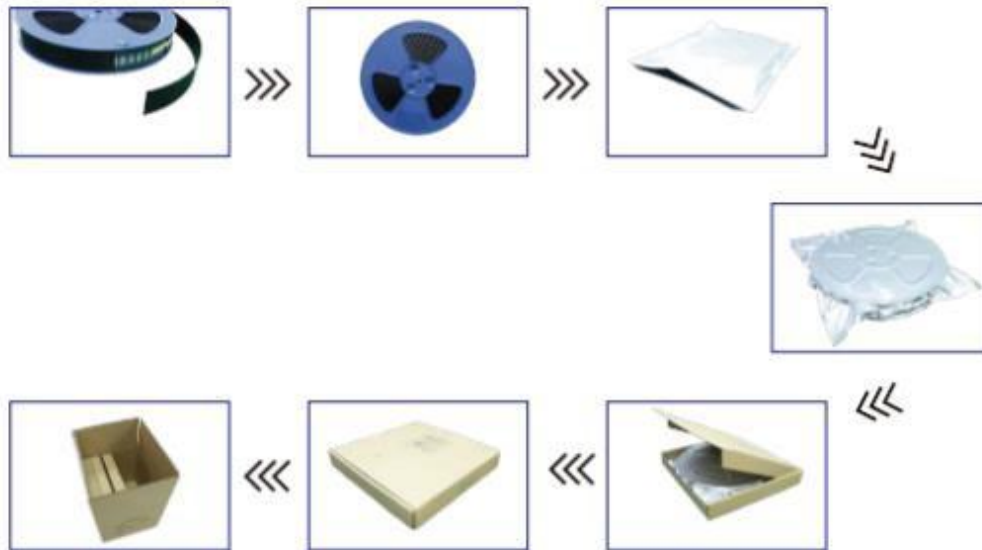


Figure 6. Brief Packaging Process of S6652P2-T Modules

6. Thermal Reflow

Referred to IPC/JEDEC standard.

Peak temperature: <250°C

Number of times: ≤2

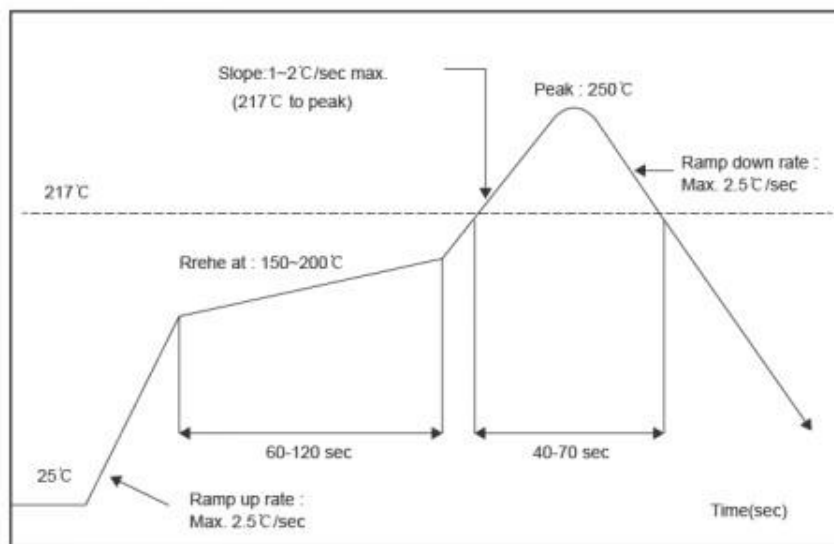


Figure 7. Recommended Reflow for Lead Free Solder

Note: The module is recommended not to go through reflow over twice.

7. Ordering Information

Part NO.	Working Voltage	ANT	Shielding Cover	Remark
S6652P2-T	VBAT:3.3V VDDIO:1.8V/3.3V	External antenna	Included	2 antennas

8. Revision History

Version	Change Content	Reviser	Date
V0.1	Draft Version	Phil Ye	2024.06.19
V0.2	Update Module Pin24 Information	Phil Ye	2024.06.24

FCC

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:

This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

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

***RF warning for Mobile device:**

The OEM must certify the final end product to comply with unintentional radiators (FCC Sections 15.107 and 15.109) before declaring compliance of the final product to Part 15 of the FCC rules and regulations. Integration into devices that are directly or indirectly connected to AC lines must add with Class II Permissive Change.

The OEM must comply with the FCC labeling requirements. If the module's label is not visible when installed, then an additional permanent label must be applied on the outside of the finished product which states: "Contains transmitter module FCC ID: 2BF4V-S6652P2-T".

Additionally, the following statement should be included on the label and in the final product's user manual:

The module is limited to installation in applications. Separate approval is required for all other operating configurations, including portable configuration with respect to Part 2.1093 and different antenna configurations. A module or modules can only be used without additional authorizations if they have been tested and granted under the same intended end - use operational conditions, including simultaneous transmission operations. When they have not been tested and granted in this manner, additional testing and/or FCC application filing may be required. The most straightforward approach to address additional testing conditions is to have the grantee responsible for the certification of at least one of the modules submit a permissive change application. When having a module grantee file a permissive change is not practical or feasible, the following guidance provides some additional options for host manufacturers. Integrations using modules where additional testing and/or FCC application filing(s) may be required are: (A) a module used in devices requiring additional RF exposure compliance information (e.g., MPE evaluation or SAR testing); (B) limited and/or split modules not meeting all of the module requirements; and (C) simultaneous transmissions for independent collocated transmitters not previously granted together. This Module is full modular approval, it is limited to OEM installation ONLY. Integration into devices that are directly or indirectly connected to AC lines must add with Class II Permissive Change. (OEM) Integrator has to assure compliance of the entire end product include the integrated Module.

Additional measurements (15B) and/or equipment authorizations (e.g. Verification) may need to be addressed depending on co-location or simultaneous transmission issues if applicable. (OEM) Integrator is reminded to assure that these installation instructions will not be made available to the end user.

Integration instructions for host product manufacturers according to KDB 996369 D03 OEM Manual v01

2.2 List of applicable FCC rules

FCC Part 15 Subpart C 15.247 & 15.207 & 15.209 & 15.205

FCC Part 15 Subpart E 15.407

2.3 Specific operational use conditions

When installed in smart terminal products, the host manufacturer must negotiate with the module manufacturer on the final installation method in the system. The module can be used for mobile applications with a maximum 3.16 dBi antenna. The host manufacturer installing this module into their product must ensure that the final product complies with the FCC requirements by a technical assessment or evaluation to the FCC rules, including the transmitter operation. The host manufacturer 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.

1. According to the following requirements of the power supply DC3.3V, power up, about 3 seconds to complete the initial.
2. iPhone/Android mobile phone BT/WIFI function to open, search to the corresponding Wireless network adapter name (name can be changed according to customer production requirements), click the name of the BT/WIFI and select the connection.
3. Open application software (need to install the company's specific application software development, application software interface can be customized according to customer's product requirements).

2.4 Limited module procedures

The module is a Single module.

Requirement per 15.212 and KDB 996369 D01	Explanation from Grantee (do not write yes/no, but explain why product complies/how it is achieved)
The radio elements must have the radio frequency circuitry shielded. Physical components and tuning capacitor(s) may be located external to the shield, but must be on the module assembly.	Has RF shielding.
The module must have buffered modulation/data inputs to ensure that the device will comply with Part 15 requirements	The modular have buffered modulation/data inputs.

with any type of input signal.	
The module must contain power supply regulation on the module.	The modular transmitter have its own power supply regulation.(DC 3.3V)
The module must contain a permanently attached antenna, or contain a unique antenna connector, and be marketed and operated only with specific antenna(s), per §§ 15.203, 15.204(b), 15.204(c), 15.212(a), 2.929(b).	The antenna adopts trace antenna design with special interface.
The module must demonstrate compliance in a stand-alone configuration.	The module was tested in a stand-alone configuration, please refer to the Setup Photo for the detail
The module must be labeled with its permanently affixed FCC ID label, or use an electronic display (see KDB Publication 784748).	Please refer to label sample exhibit - host labeling is described in integration manual
The module must comply with all specific rules applicable to the transmitter, including all the conditions provided in the integration instructions by the grantee.	The required FCC rule has been fulfilled and all the instructions for the maintaining compliance have been clearly stated in the User Manual.
The module must comply with RF exposure requirements	The MPE evaluation with 20cm distance restriction is submitted for the compliance of RF Exposure requirement.

2.5 Trace antenna designs

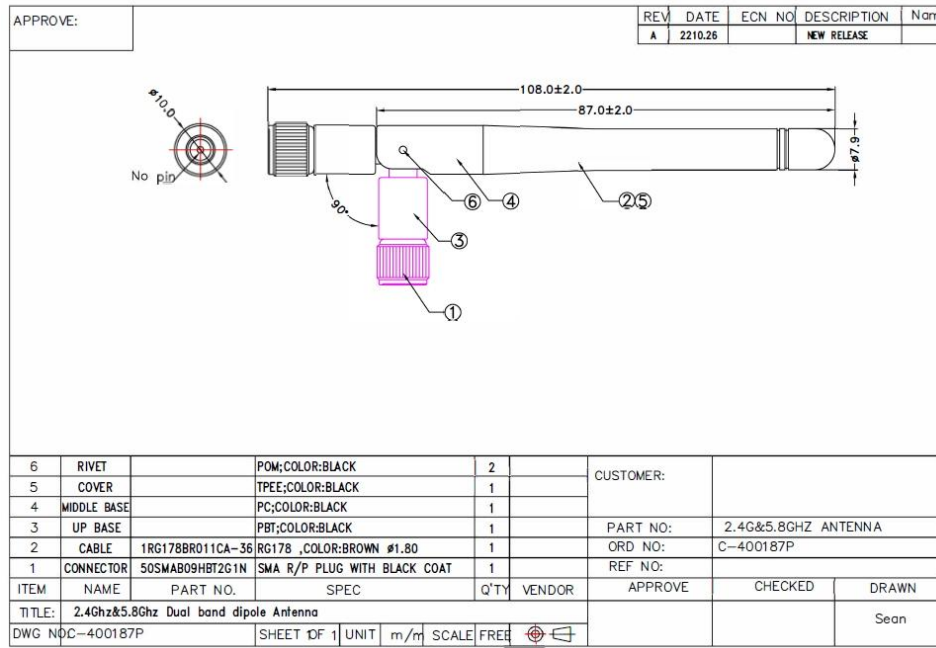
Please perform the Trace antenna design that followed the specifications of the antenna.

The concrete contents of a check are the following three points.

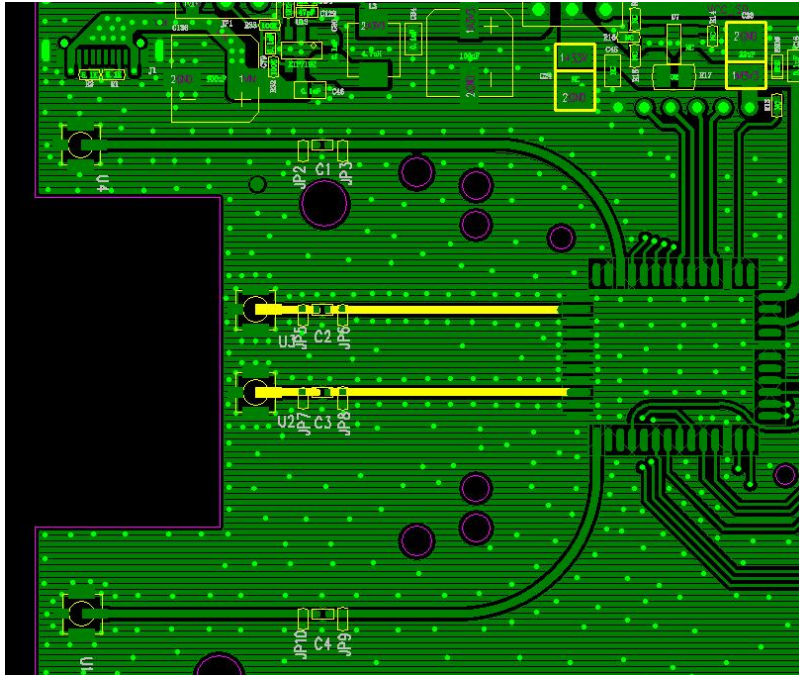
- 1) It is the same type as the antenna type of antenna specifications. Confirm the same size as the Gerber file.
- 2) An antenna gain is lower than a gain given in antenna specifications. Measure the gain, and confirm the peak gain is less than 3.16dBi.
- 3) The emission level is not getting worse. Measure the spurious, and confirm degradation of less than 3dB than spurious value of worst of report used for the application.

Rod Antenna specification

You can see antenna size is $108 \pm 2\text{mm} \times 7.9\text{mm}$ * From below Specification.



Please refer to the chart below for PCB size of RF line terminal.



Scrape a GND off the side of the U2 and U3, connect the antenna to the PCB at the position of the U2 and U3 connector.

[The line between the antenna and the WiFi module] must be 50 ohm.

C2 and C3 are 0 R Capacitors.

2.6 RF exposure considerations

The module complies with FCC radiation exposure limits set forth for an uncontrolled environment. The module should be installed and operated with minimum distance 20cm between the radiator & your body.

The host manufacturer 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.).

2.7 Label and compliance information

Host product manufacturers need to provide a physical or e-label stating

“Contains FCC ID: 2BF4V-S6652P2-T With their finished product.

2.8 Information on test modes and additional testing requirements

If RF exposure statement or module layout is changed, then the host product manufacturer required to take responsibility of the module through a change in FCC ID or new application. The FCC ID of the module cannot be used on the final product. In these

circumstances, the host manufacturer will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization. When the host is a portable device, it is necessary to take a SAR test with your set mounting this module. Class II permissive change application is necessary using the SAR report. Please contact kevin (kevin@sziton.com). And an application for a Class II permissive change from a Mobile equipment to a Portable equipment is also required.

Note) Portable equipment : Equipment for which the spaces between human body and antenna are used within 20cm. Mobile equipment : Equipment used at position in which the spaces between human body and antenna exceeded 20cm.

Host manufacturer must perform test of radiated & conducted emission and spurious emission, etc according to the actual test modes for a stand-alone modular transmitter in a host, as well as for multiple simultaneously transmitting modules or other transmitters in a host product.

Only when all the test results of test modes comply with FCC requirements, then the end product can be sold legally.

2.9 Additional testing, Part 15 Subpart B disclaimer

The modular transmitter is only FCC authorized for FCC Part 15 Subpart C 15.247 & 15.407 & 15.207 & 15.209 & 15.205 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 circuitry), 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.

2.10 The user manual of the end product should include:

- a) Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.
- b) The antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons.
- c) This device is restricted to indoor use.

The antenna(s) used for this transmitter must not transmit simultaneously with any other antenna or transmitter.