

AW55S2-50B1

SN:0111

IEEE 802.11a/b/g/n/ac 1T1R+BT5.0 Combo Module
(Draft)

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1. Device Overview

1.1 Features

1.1.1 General Features

- 32bit MCU for Wi-Fi protocols and host offload
- 32bit MCU for Bluetooth controller
- Embedded SRAM/ROM
- Programmable and multiplexed GPIO pins
- Integrated high efficiency power management unit
- 15.0mm*13.0mm LGA package

1.1.2 IEEE 802.11X Key Features

- IEEE 802.11 a/b/g/n/ac compliant
- Supports 20MHz, 40MHz, 80MHz bandwidth in 2.4GHz/5GHz band
- Integrated diplexer
- Comprehensive RF and analog self-calibration
- SDIO 3.0 interface up to 208MHz
- STBC decoding
- LDPC encoding and decoding
- Beam-forming receiving
- AMPDU and AMSDU for maximum throughput
- GTK offload (optional)
- ARP/NS offload (optional)
- DHCP offload (optional)
- Wake-on-Wireless with programmable magic packet
- P2P concurrent mode

1.1.3 Bluetooth Key Features

- Dual-mode BT 5.0 supporting BDR, EDR, LE1M, LE2M, LE2S and LE8S rates
- Supports LE privacy, DPLE, LE secure connection
- Supports HS UART and PCM host interfaces
- Supports eSCO with retransmission
- Supports 2 antennas configuration, shared with Wi-Fi 2.4GHz or dedicated BT antenna(optional)
- Supports AFH for interference avoidance
- Supports Bluetooth Core 5.0 features
- Supports Bluetooth Core 4.2 features
- Supports low power mode
- Hardware engine assisted PTA to support Wi-Fi/BT and external 802.15.4 co-existence

1.2 Descriptions

AW55S2-50B1 is an integrated Wi-Fi and Bluetooth combo module. It has a host interface of SDIO3.0 for Wi-Fi and UART HS for Bluetooth. Wi-Fi is fully compliant with IEEE 802.11ac standard and operated at both 2.4GHz band and 5GHz band. It can support up to 80MHz bandwidth and PHY data rate of 433Mbps. Located in the same die is the Bluetooth system that can support both Classic BDR/EDR and BLE mode. As a station, AW55S2-50B1 MAC can support beam-forming receiving and MU-MIMO to be compatible with more advanced AP on the other end.

AW55S2-50B1 module provides auto calibration scheme to help Wi-Fi radio transceiver and BT radio to be in the best state when it is powered up as well as in harsh environment. Additionally, Digital Pre-distortion (DPD) is implemented to improve PA performance.

1.3 Functional Block Diagram

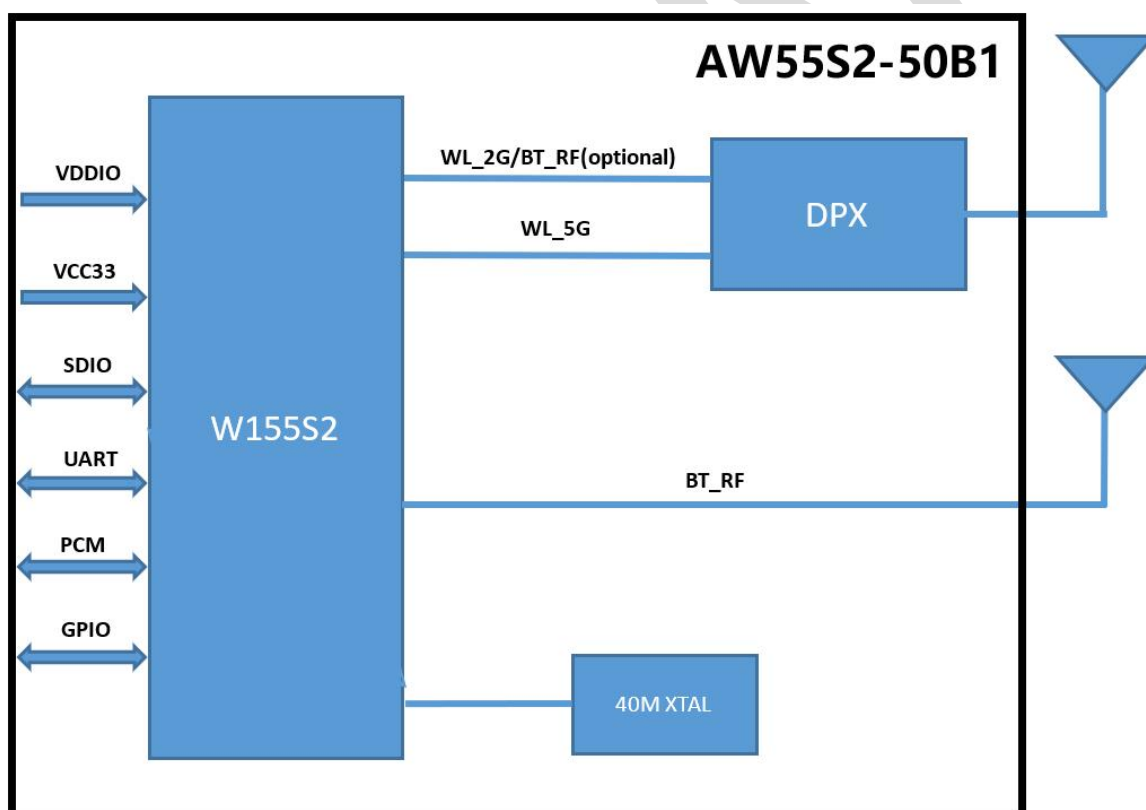


Figure 1. Block Diagram of AW55S2-50B1

2. Pin Configuration and Functions

2.1 Module Pin Diagram

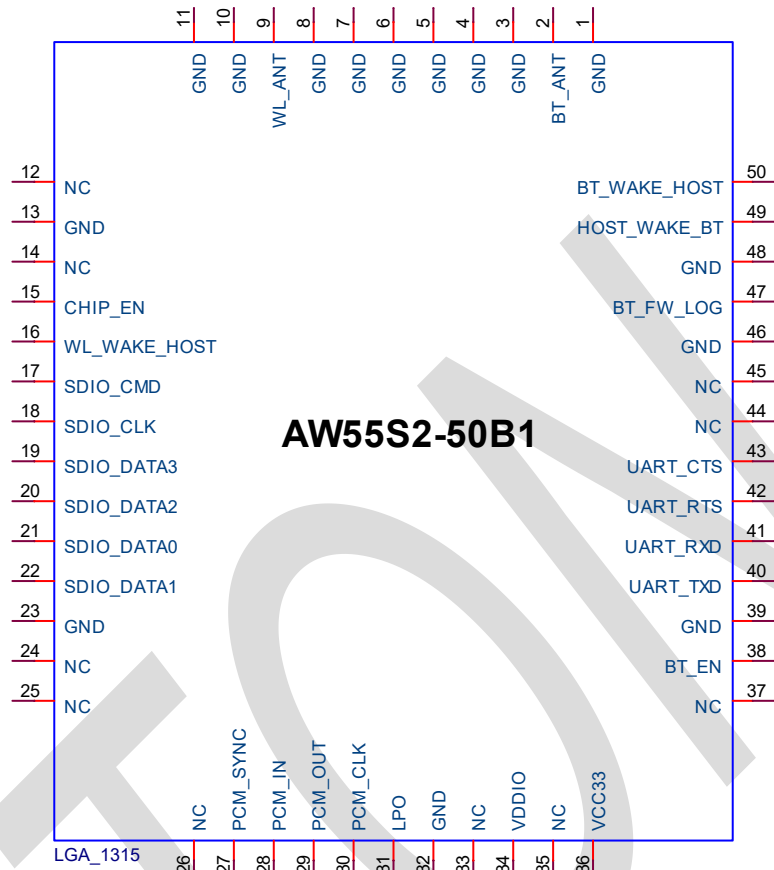


Figure 2.Pin Diagram of AW55S2-50B1

2.2 Pin Functions

Pin	Name	Description
1	GND	Ground
2	BT_ANT	BT antenna port
3	GND	Ground
4	GND	Ground
5	GND	Ground
6	GND	Ground
7	GND	Ground
8	GND	Ground
9	WL_ANT	Wi-Fi antenna port Can be configured to shared BT antenna with this port

10	GND	Ground
11	GND	Ground
12	NC	No connected
13	GND	Ground
14	NC	No connected
15	CHIP_EN	Chip enable(Default High)
16	WL_WAKE_HOST	WLAN wake up host
17	SDIO_CMD	SDIO command line
18	SDIO_CLK	SDIO clock line
19	SDIO_DATA3	SDIO port data 3
20	SDIO_DATA2	SDIO port data 2
21	SDIO_DATA0	SDIO port data 0
22	SDIO_DATA1	SDIO port data 1
23	GND	Ground
24	NC	No connected
25	NC	No connected
26	NC	No connected
27	PCM_SYNC	PCM synchronization control
28	PCM_IN	PCM data input
29	PCM_OUT	PCM data output
30	PCM_CLK	PCM clock
31	LPO	32KHz clock input
32	GND	Ground
33	NC	No connected
34	VDDIO	1.8V power supply
35	NC	No connected
36	VCC33	3.3V power supply
37	NC	No connected
38	BT_EN	GPIO/BT enable
39	GND	Ground
40	UART_TXD	UART port TX
41	UART_RXD	UART port RX
42	UART_RTS	UART port RTS
43	UART_CTS	UART port CTS
44	NC	No connected
45	NC	No connected

46	GND	Ground
47	BT_FW_LOG	GPIO. Mux Uart BT Print Out
48	GND	Ground
49	HOST_WAKE_BT	Host wake up Bluetooth device
50	BT_WAKE_HOST	BT wake up Host(Default High)

3. Specifications

3.1 General Characteristics

Category	Descriptions
Dimension	L*W*H :15mm (±0.2mm)*13mm (±0.2mm)*2.2mm (±0.2mm)
Chip-set	W155S2
Standard	IEEE 802.11a/b/g/n/ac +BT 5.0
Modulation Type	CCK, OFDM (16 QAM/64 QAM/256 QAM)
Frequency Band	2412~2484MHz,5180-5825MHz
Interface	WLAN SDIO, Bluetooth UART
Spread Spectrum	DSSS
Transmission Distance	Indoor up to 100m, outdoor up to 300m (limited in an environment)
Transmit Powers(Conducted)	2.4G: 11b 1M:18±2dBm 11b 11M:18±2dBm 11g 6M:18±2dBm 11g 54M:16±2dBm 11n HT20 MCS0:18±2dBm 11n HT20 MCS7:16±2dBm 11n HT40 MCS0:18±2dBm 11n HT40 MCS7:15±2dBm 5G: 11a 6M:18±2dBm 11a 54M:15±2dBm 11n HT20 MCS0:18±2dBm 11n HT20 MCS7:15±2dBm 11n HT40 MCS0:18±2dBm 11n HT40 MCS7:15±2dBm 11ac VTH20 MCS0:18±2dBm 11ac VTH20 MCS8:13±2dBm 11ac VTH40 MCS0:18±2dBm 11ac VTH40 MCS9:12±2dBm 11ac VTH80 MCS0:18±2dBm 11ac VTH80 MCS9:12±2dBm

Rx Sensitivity	2.4G: 11b 11M: -88dBm@8% PER 11g 54M: -74dBm@10% PER 11n HT20 MCS7: -73dBm@10% PER 11n HT40 MCS7: -69dBm@10% PER 5G: 11a 54M: -74dBm@10% PER 11n HT20 MCS7: -72dBm@10% PER 11n HT40 MCS7: -69dBm@10% PER 11ac VTH80 MCS9: -58dBm@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 72.2Mbps 802.11n HT40: up to 150Mbps 802.11ac VHT80: up to 433Mbps
Frequency Error	2.4GHz: <±15 ppm(11b), <±15 ppm(11g/n); 5GHz: <±15 ppm
Ambient Temperature	0°C~70°C
Storage Temperature	-40°C~125°C
Antenna	External antenna
Operating System	Android OS
Operating Voltage	VCC33 (Typ) : 3.3V@1A; VDDIO: 1.8V

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						
2.4GHz	802.11b/g/n 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
Maximum Input Level						
802.11b	FER<8%		-10	-	-	dBm
802.11g	FER<10%		-20	-	-	dBm
802.11n	FER<10%		-30			dBm

Parameter	Conditions		Min.	Nom.	Max.	Unit
Receive Input Frequency						
5GHz	802.11a/n/ac mode		5170	-	5835	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)	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
802.11ac (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
Maximum Input Level						
802.11a	FER<10%		-30	-	-	dBm
802.11n	FER<10%		-30	-	-	dBm
802.11ac	FER<10%		-30	-	-	dBm

3.2.2 Transmitter RF Specifications

Parameter	Condition	Min.	Nom.	Max.	Unit.
Receive Input Frequency					
802.11b/g/n	2.4GHz	2400	-	2500	MHz
Transmit Power					
802.11b	1Mbps	17	19	21	dBm
	11Mbps	17	19	21	dBm
802.11g	6Mbps	16	18	20	dBm
	54Mbps	14	16	18	dBm
802.11n	HT20, MCS0	16	18	20	dBm
	HT20, MCS7	14	16	18	dBm
	HT40, MCS0	16	18	20	dBm
	HT40, MCS7	13	15	17	dBm
Spectrum Mask					
802.11b	$f_c - 22\text{MHz} < f < f_c - 11\text{MHz} \& f_c + 11\text{MHz} < f <$	-	-	-30	dBr

	$f_c+22\text{MHz}$				
	$f_c-55\text{MHz}<f<f_c-22\text{MHz}\&f_c+22\text{MHz}<f<f_c+55\text{MHz}$	-	-	-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
Center Frequency Tolerance					
802.11b		-15	-	+15	ppm
802.11g/n		-15	-	+15	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

Parameter	Condition	Min.	Nom.	Max.	Unit.
Receive Input Frequency					
802.11a/n/ac	5GHz	5170	-	5835	MHz
Transmit Power					
802.11a	6Mbps	17	19	21	dBm

	54Mbps	13	15	17	dBm
802.11n	HT20, MCS0	16	18	20	dBm
	HT20, MCS7	13	15	17	dBm
	HT40, MCS0	16	18	20	dBm
	HT40, MCS7	13	15	17	dBm
802.11ac	VHT20, MCS0	15	17	19	dBm
	VHT20, MCS8	11	13	15	dBm
	VHT40, MCS0	15	17	19	dBm
	VHT40, MCS9	10	12	14	dBm
	VHT80, MCS0	15	17	19	dBm
	VHT80, MCS9	10	12	14	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
Center Frequency Tolerance					
802.11a/n/ac		-15	-	+15	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

3.2.3 Bluetooth RF Specifications

Parameter	Conditions	Minimum	Typical	Maximum	Unit
Frequency range		2402		2480	MHz
RX sensitivity	1 Mbps	-	-91	-	dBm
	2 Mbps	-	-92	-	dBm
	3 Mbps	-	-85	-	dBm
	LE 1M		-94		dBm
	LE 2M		-91		dBm
Initial carrier frequency tolerance	BR	-75	-	75	KHz
LE Carrier frequency drift	Frequency offset	-150	-	150	KHz
	Frequency drift	-50	-	50	KHz
Output power(Conducted)	BR	-	10	-	dBm
	EDR	-	7	-	dBm
	LE 1M	-	10	-	dBm
	LE 2M	-	10	-	dBm

3.3 Absolute Maximum Ratings

Symbol	Description	Max	Unit
VCC33	Power supply for VCC33	3.63	V
VDDIO	I/O supply voltage	1.98	V

3.4 Recommended Operating Conditions

Symbol	Parameter	Min	Typ	Max	Unit
VCC33	Power supply for VCC33	2.97	3.3	3.63	V

VDDIO	I/O supply voltage	1.62	1.8	1.98	V
Ta	Operating ambient temperature	0		70	°C

3.5 DC Electrical Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V _{IL}	Input Low Voltage	VDDIO=1.8V	-0.3		VDDIOx0.35	V
V _{IH}	Input High Voltage	VDDIO=1.8V	VDDIOx0.65		VDDIO+0.3	V
V _{oL}	Output Low Voltage	VDDIO=1.8V	-0.3		0.2	V
V _{oH}	Output High Voltage	VDDIO=1.8V	VDDIO-0.2		VDDIO+0.3	V

4. Application and Implementation

4.1 Wi-Fi Application Diagram

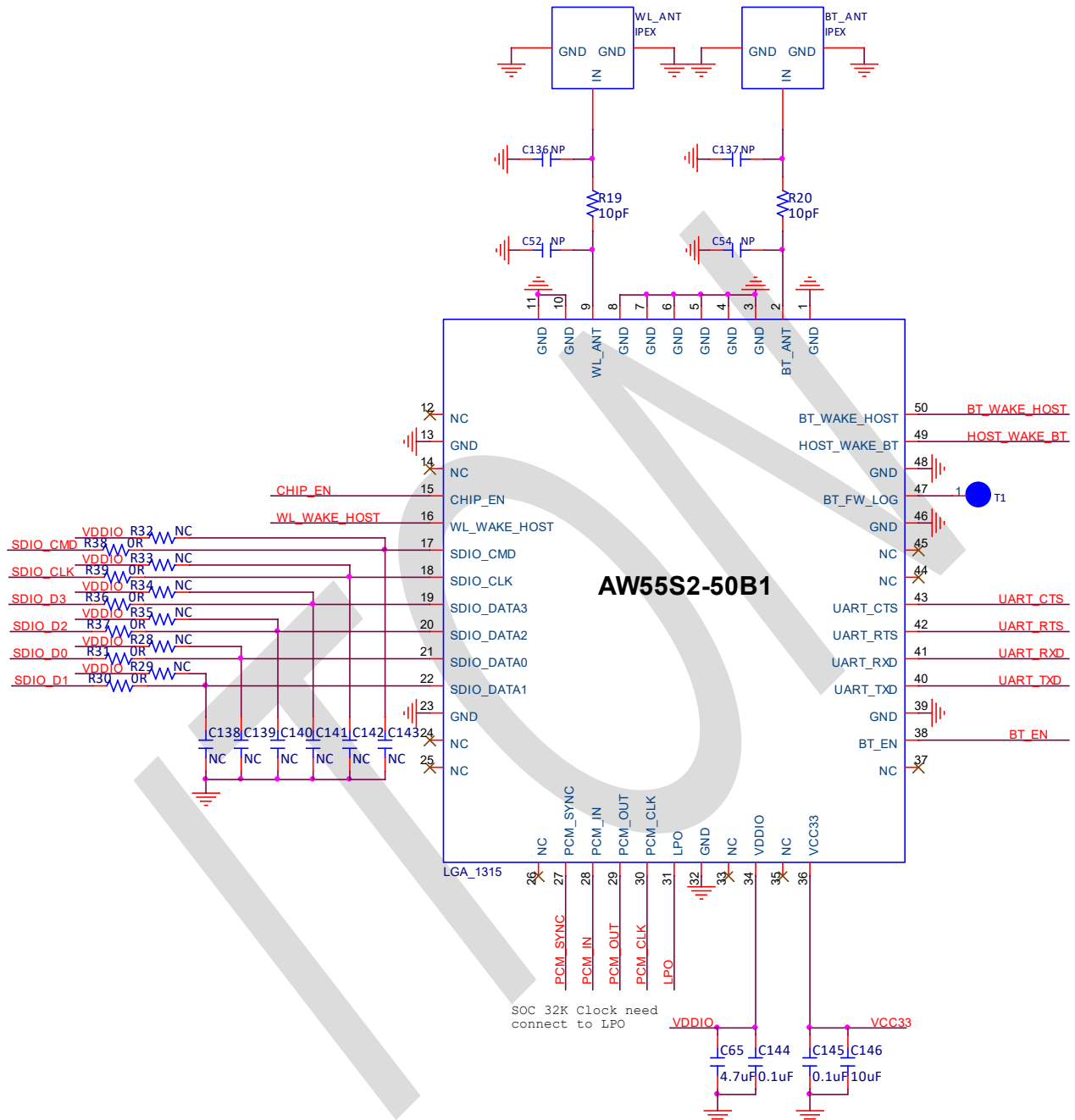


Figure 3. Application Circuit Diagram of AW55S2-50B1

5. Mechanical and Package

5.1 Mechanical Size

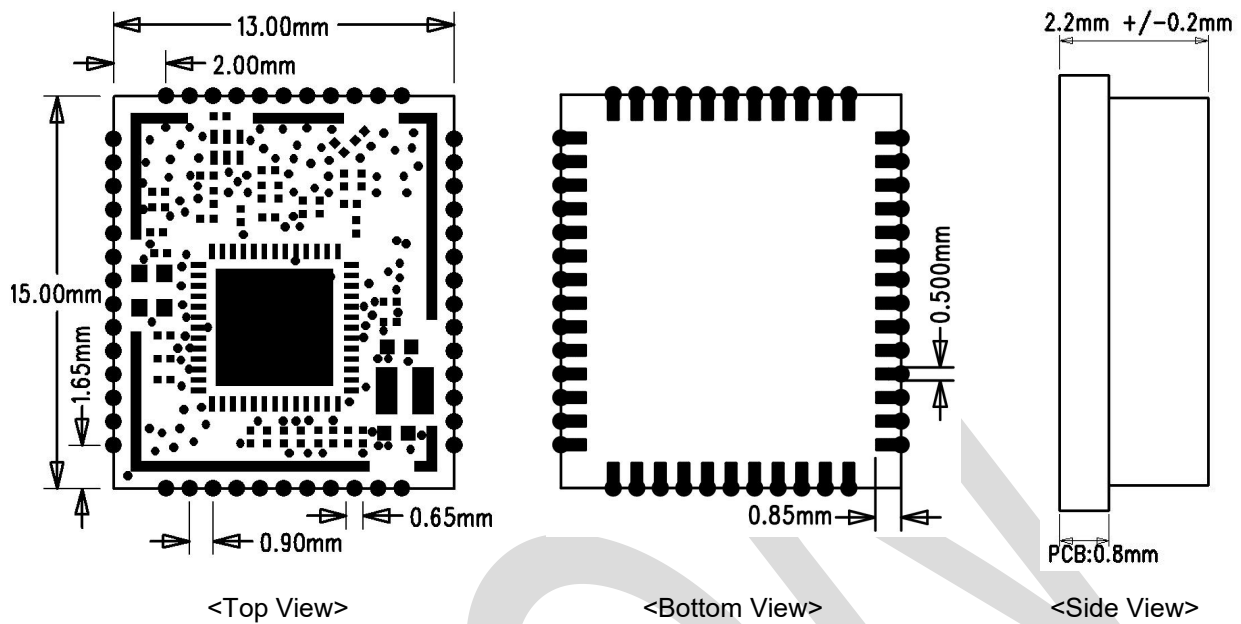


Figure 4. Mechanical Size of AW55S2-50B1

5.2 Package Information

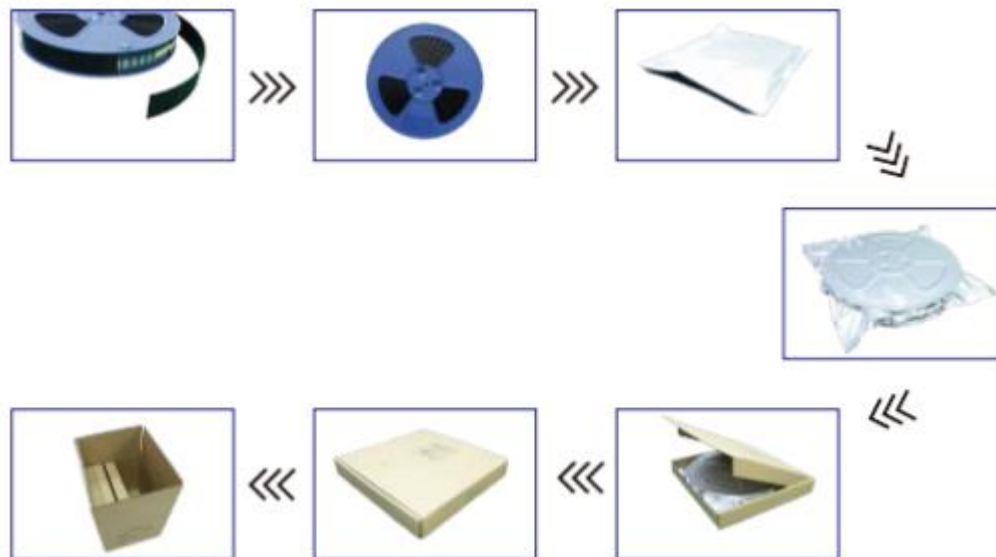


Figure 5. Brief Packaging Process of AW55S2-50B1 Modules

6. Thermal Reflow

Referred to IPC/JEDEC standard.

Peak temperature: <250°C

Number of times: ≤2

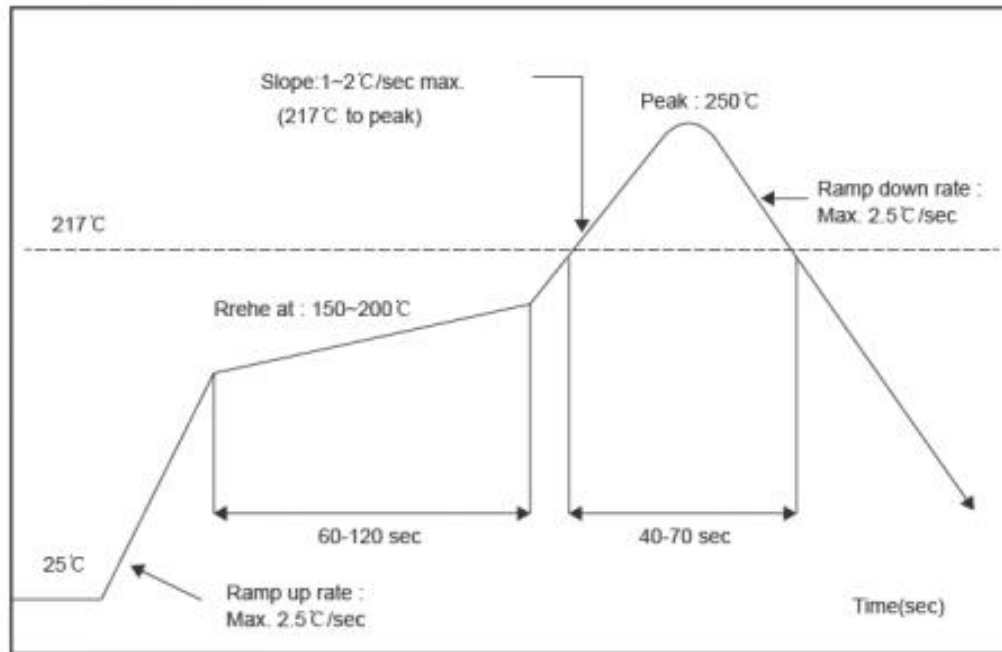


Figure 6. Recommended Reflow for Lead Free Solder

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

7. Ordering Information

Part No.	Working Voltage	ANT	Shielding Cover	Remark
AW55S2-50B1	VCC33:3.3V VDDIO:1.8V	2 antennas	No Included	SN:0111

8. Revision History

Version	Change Content	Reviser	Date
V0.1	Draft Version	Phil Ye	2024.03.14

FCC Interference 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 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:**

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.

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-AW55S2-50B1".

Additionally, the following statement should be included on the label and in the final product's user 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 interferences, and
 - (2) this device must accept any interference received, including interference that may cause undesired operation."
- 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
- ITON Technology Corp.

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.

The module should be installed and operated with minimum distance 20cm between the radiator & your body. and 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.

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 with any type of input signal.	The modular have buffered modulation/data inputs.
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,	Antenna restrictions are added in the manual.The antenna needs to be professionally installed.

15.204(b), 15.204(c), 15.212(a), 2.929(b).	
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

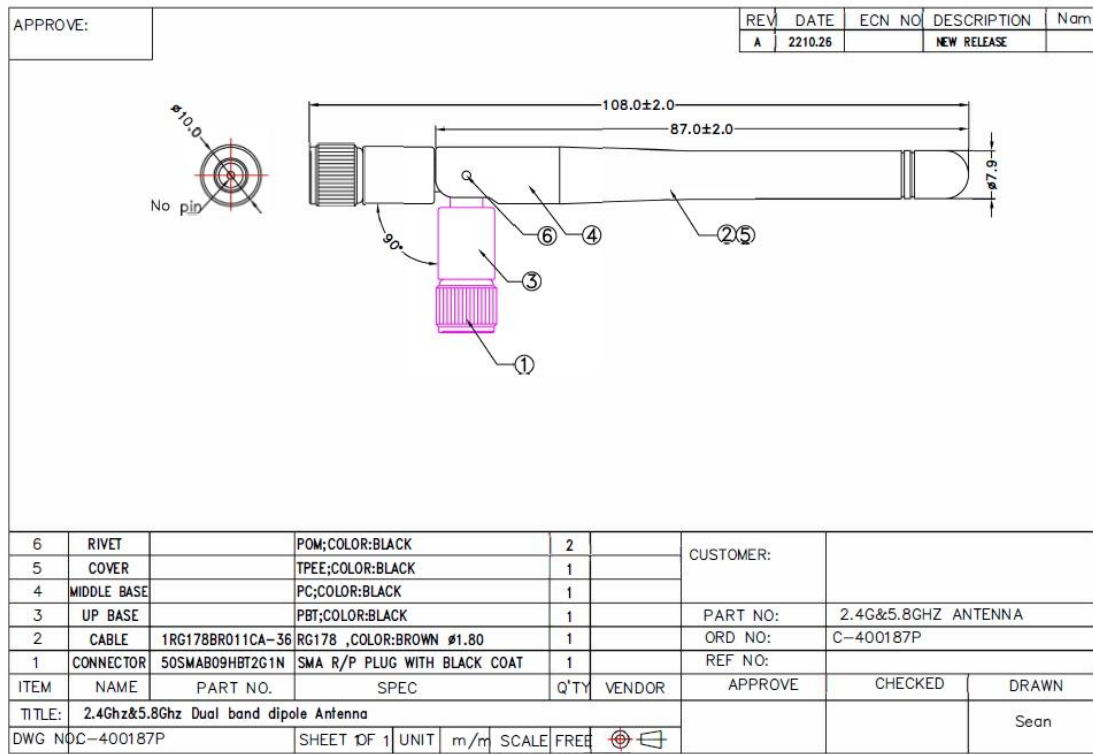
Please perform the Trace antenna design that followed the specifications of the antenna.

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

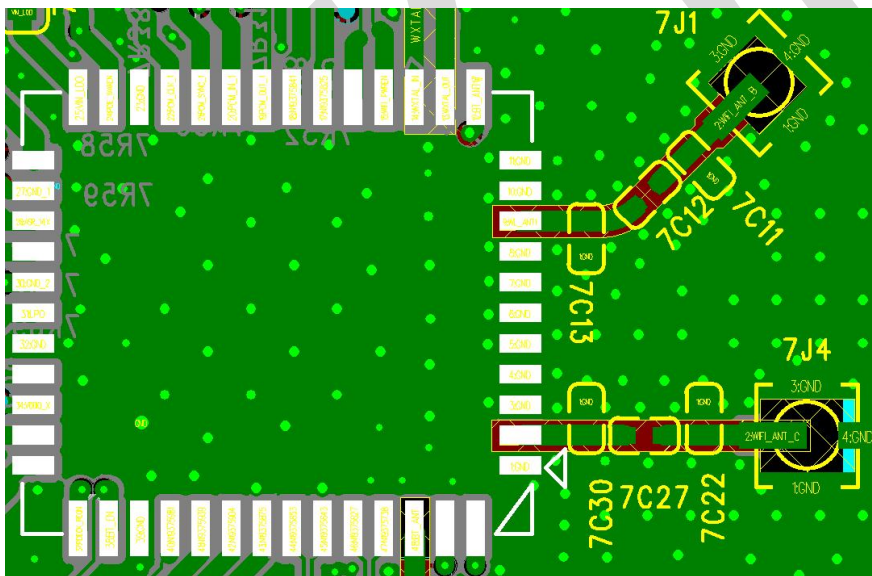
- 1) It is the same type as the antenna type of antenna specifications. Confirm the same size as the Gerber file.
- 2) An antenna gain is lower than a gain given in antenna specifications. Measure the gain, and confirm the peak gain is less than 3.16dBi.
- 3) The emission level is not getting worse.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

Dipole 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 7J1 and 7J4, connect the FPC antenna to the PCB at the position of the 7J1 and 7J4 connector.

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

7C12 and 7C27 are 10pF 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.

2.7 Antennas

This module has been approved to operate with the antenna types listed below, with the maximum permissible gain indicated. The module antenna requires professional installation, and the antenna type cannot be changed. The gain cannot exceed 3.16dBi.

Frequency band	Antenna Type	Model Number	Max Gain
2400-2500MHz	Dipole Antenna	N1911	2.53(dBi)
5150~5250MHz	Dipole Antenna	N1911	1.87(dBi)
5250~5350MHz	Dipole Antenna	N1911	2.11(dBi)
5470~5725MHz	Dipole Antenna	N1911	2.93(dBi)
5725~5850MHz	Dipole Antenna	N1911	3.16(dBi)

This device is intended only for host manufacturers under the following conditions: The transmitter module may not be co-located with any other transmitter or antenna; The module shall be only used with the External antenna(s) that has been originally tested and certified with this module. The antenna must be either permanently attached or employ a 'unique' antenna coupler.

As long as the conditions above are met, further transmitter test will not be required. However, 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.).

2.8 Label and compliance information

Host product manufacturers need to provide a physical or e-label stating "Contains FCC ID: 2BF4V-AW55S2-50B1 With their finished product.

2.9 Information on test modes and additional testing requirements

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. and 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.

2.10 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.

2.11 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 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.
- d) This device is restricted to indoor use.
- e) The antenna(s) used for this transmitter must not transmit simultaneously with any other antenna or transmitter.