

# WiFi/BT Combo Module

Model: SBW-M3

## Product Specification

Designed by	Checked by	Approved by

## Revision Record

Rev. No	Date	Item	Modifications	Approved



## **Federal Communication Commission Interference Statement**

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.

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 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 Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

### ***Radiation Exposure Statement:***

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

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

1) The antenna must be installed such that 20 cm is maintained between the antenna and users, and 2) The transmitter module may not be co-located with any other transmitter or antenna. As long as 2 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

**IMPORTANT NOTE:** In the event that these conditions can not be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID can not be used on the final product. In these circumstances, the OEM integrator will be responsible for reevaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

### ***End Product Labeling***

This transmitter module is authorized only for use in device where the antenna may be installed such that 20 cm may be maintained between the antenna and users. The final end product must be labeled in a visible area with the following: "Contains FCC ID: WF5SBWM3". The grantee's FCC ID can be used only when all FCC compliance requirements are met.

### ***Manual Information To the End User***

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.



## ISED Canada (IC) Statement

This Class B digital apparatus complies with Canadian ICES-003.

***This device complies with Industry Canada licence-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.

### ***RF Radiation Exposure Statement:***

This equipment complies with IC 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.

### ***Required end product labeling:***

Any device incorporating this module must include an external, visible, permanent marking or label which states: "Contains IC: 9080A-SBWM3"

This radio transmitter (identify the device by certification number or model number if Category II) has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

## **Canada, Industrie Canada (IC) Déclaration**

Cet appareil numérique de classe B est conforme à la norme NMB-003.

***Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence.*** L'exploitation est autorisée aux deux conditions suivantes:

- (1) l'appareil ne doit pas produire de brouillage, et
- (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

### ***Déclaration d'exposition aux radiations:***

Cet appareil est conforme aux limites d'exposition aux rayonnements définies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé à une distance minimale de 20 centimètres entre le radiateur et votre corps.

### ***Obligation d'étiquetage du produit final:***

Tout dispositif intégrant ce module doit comporter un externe, visible, marquage permanent ou une étiquette qui dit: "Contient IC : 9080A-SBWM3".

Cet émetteur radio ( identifier le dispositif par numéro de certification ou le numéro de modèle , si la catégorie II ) a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés ci-dessous avec le gain maximal admissible indiqué . types d'antennes non inclus dans cette liste , ayant un gain supérieur au gain maximum indiqué pour ce type , sont strictement interdits pour une utilisation avec cet appareil.

# Overview

1. Antenna Specification
  - (1) Bluetooth Antenna
  - (2) WiFi Antenna
2. Description:
  - (1) Electrical Characteristics
  - (2) Pin Map
3. RF Specifications
  - (1) Bluetooth RF Specifications
  - (2) WiFi RF Specifications
4. Certification Information

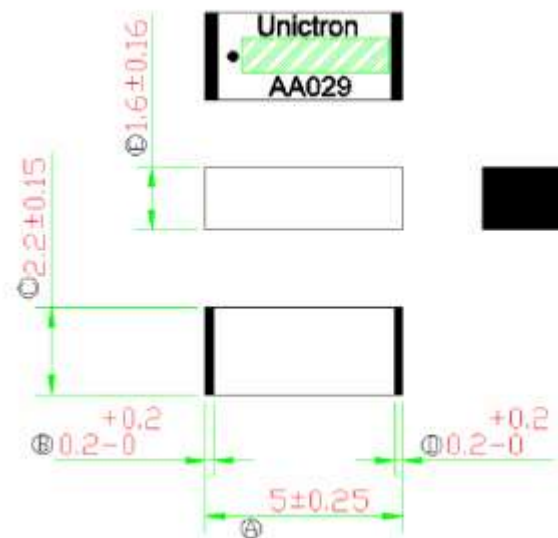
## 1. Antenna specification

### (1) Bluetooth Antenna

#### 1) Electrical specification

Frequency range	2.4 GHz band	
	2 400 MHz	2 485 MHz
VSWR	2.5 : 1	3.5 : 1
Peak Gain [dBi]	2.03	0.85
Impedance	50 $\Omega$	
Polarization	Linear	

#### 2) Mechanical specification



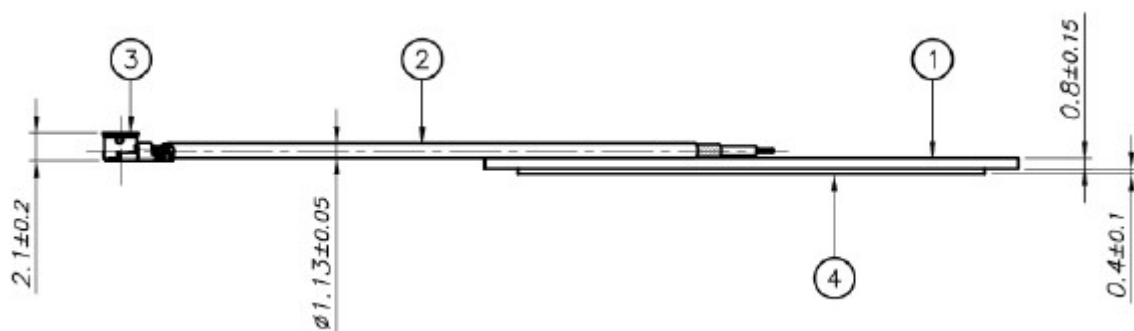
## (2) WiFi Antenna

### 1) Electrical specification

Frequency range	2.4 GHz band	
	2 400 MHz	2 485 MHz
VSWR	2.5 : 1	3.5 : 1
Peak Gain [dBi]	2.81	2.25
Impedance	50 $\Omega$	
Polarization	Linear	

Frequency range	5 GHz band	
	5 150 MHz	5 875 MHz
VSWR	2.5 : 1	3.5 : 1
Peak Gain [dBi]	3.52	4.60
Impedance	50 $\Omega$	
Polarization	Linear	

### 2) Mechanical specification



## 2. Description

### (1) Electrical Characteristics

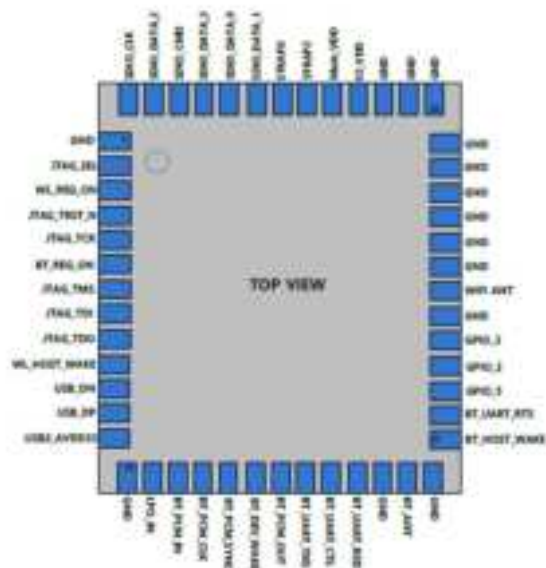
Parameter	Min	Typ.	Max	Unit
Supply Voltage	3.0	3.3	4.8	V
Storage Temperature	-40	25	125	°C

### (2) Pin Map

Pin No.	Pin Name	Description	Pad Type
1	GND	Common Ground	
2	JTAG_SEL		Bi-directional
3	WL_REG_ON	WLAN Power On Reset	Input
4	JTAG_TRST_N		Bi-directional
5	JTAG_TCK		Bi-directional
6	BT_REG_ON	Bluetooth Power On Reset	Input
7	JTAG_TMS		Bi-directional
8	JTAG_TDI		Bi-directional
9	JTAG_TDO	Programmable input/output line	Bi-directional
10	WL_HOST_WAKE		CMOS Output
11	USB_DM	USB Data minus	Bi-directional
12	USB_DP	USB Data Plus	Bi-directional
13	USB2_AVDD33		Bi-directional
14	GND	Common Ground	
15	LPO_32.768	Low Power Oscillator	CMOS Input
16	BT_PCM_IN	Synchronous Data Input	CMOS Input
17	BT_PCM_CLK	Synchronous Data Clock	Bi-directional
18	BT_PCM_SYNC	Synchronous Data Sync	Bi-directional
19	BT_DEV_WAKE	Host to wake Bluetooth	CMOS Input
20	BT_PCM_OUT	Synchronous Data Output	CMOS Output
21	BT_UART_TXD	UART Data Output	Bi-directional
22	BT_UART_CTS		Bi-directional
23	BT_UART_RXD	UART Data Input	CMOS Input
24	GND	Common Ground	
25	BT_ANT	Bluetooth Antenna	RF
26	GND	Common Ground	
27	BT_HOST_WAKE	Bluetooth to wake host	CMOS Output
28	BT_UART_RTS		CMOS Input



Pin No.	Pin Name	Description	Pad Type
29	GPIO5	Programmable input/output line	Bi-directional
30	GPIO2	Programmable input/output line	Bi-directional
31	GPIO3	Programmable input/output line	Bi-directional
32	GND	Common Ground	
33	WIFI_ANT	WIFI Antenna	RF
34	GND	Common Ground	
35	GND	Common Ground	
36	GND	Common Ground	
37	GND	Common Ground	
38	GND	Common Ground	
39	GND	Common Ground	RF
40	GND	Common Ground	
41	GND	Common Ground	
42	GND	Common Ground	
43	IO_VDD	Input/Output(IO Port) Power 1.8V	Power
44	Main_VDD	Main Power 3.3V	Power
45	STRAP_2		
46	STRAP_0		
47	SDIO_DATA_1	SDIO V3.0 data line 1	Bi-directional
48	SDIO_DATA_0	SDIO V3.0 data line 0	Bi-directional
49	SDIO_DATA_3	SDIO V3.0 data line 3	Bi-directional
50	SDIO_CMD	SDIO V3.0 common line	Bi-directional
51	SDIO_DATA_2	SDIO V3.0 data line 2	Bi-directional
52	SDIO_CLK	SDIO V3.0 clock line	Bi-directional



### 3. RF Specifications

#### (1) Bluetooth RF Specifications

Bluetooth Receiver RF Specifications

Parameter		Min	Typ	Max	Unit
Frequency Range		2402		2480	MHz
RX sensitivity	GFSK, 0.1%BER, 1Mbps		-88	-93.5	dBm
	$\pi/4$ -DQPSK, 0.01% BER, 2Mbps		-88	-93.5	
	8-DPSK, 0.01% BER 3Mbps		-80	-89.5	
C/I co-channel	GFSK, 0.1%			11	dB
	$\pi/4$ -DQPSK, 0.1%			13	
	8-DPSK, 0.1%			21	
C/I 1MHz Adj. Ch.	GFSK, 0.1%			0	
	$\pi/4$ -DQPSK, 0.1%			0	
	8-DPSK, 0.1%			5	
C/I 2MHz Adj. Ch.	GFSK, 0.1%			-30	
	$\pi/4$ -DQPSK, 0.1%			-30	
	8-DPSK, 0.1%			-25	
C/I $\geq 3$ MHz Adj. Ch.	GFSK, 0.1%			-40	
	$\pi/4$ -DQPSK, 0.1%			-40	
	8-DPSK, 0.1%			-33	
C/I image channel	GFSK, 0.1%			-9	
	$\pi/4$ -DQPSK, 0.1%			-7	
	8-DPSK, 0.1%			0	
Spurious Emissions	30MHz~1GHz		-95	-62	dBm
	1~12.75GHz		-70	-47	
	851~894MHz		-147		
	925~960MHz		-147		
	1805~1880MHz		-147		
	1930~1990MHz		-147		
	2110~2170MHz		-147		

#### Bluetooth Transmitter RF Specifications

Parameter		Min	Typ	Max	Unit
Frequency Range		2402		2480	MHz
TX sensitivity		-4	2	6	dBm
Power Control step			4		dB
20dB bandwidth			960	1000	MHz
Out-of Band Spurious Emissions	30MHz~1GHz			-36	dBm
	1GHz~12.75GHz			-30	
	1.8GHz~5.3GHz			-47	
	5.1GHz~5.3GHz			-47	

#### Local Oscillator Performance

Parameter		Min	Typ	Max	Unit
Initial Carrier Frequency Tolerance		-75	±25	+75	MHz
Frequency Drift	DH1 packet		±8	±25	kHz
	DH3 packet		±8	±40	
	DH5 packet		±8	±40	
	Drift rate		5	20	kHz/50us

#### BLE RF Specifications

Parameter		Min	Typ	Max	Unit
Frequency Range		2402		2480	MHz
TX sensitivity			8.5		dBm
RX sense			-92	-95.5	dBm
Mod Char.	Delta F1 average	225	255	275	kHz
	Delta F2 average	230			
	Ratio	0.8	1.00		

Note: The above-mentioned values may vary depending on the circuit, in which this component is actually incorporated. You are, therefore, kindly requested to test the performance of this component t incorporating in your set.

## (2) WiFi RF Specifications

### 2.4GHz Band RF Specifications

2.4GHz Switch time specifications

Item	Min	Typ	Max	Unit
TX/RX Switch time			5	us
RX/TX Switch time			2	Us
Power-up and power-down ramp time			<2	us

WLAN 2.4GHz Receiver Performance Specifications

Parameter	Condition/Notes	Min	Typ	Max	Unit
Frequency range	–	2400	–	2500	MHz
RX sensitivity IEEE 802.11b (8% PER for 1024 octet PSDU)	1 Mbps DSSS	–	–98.4	–	dBm
	2 Mbps DSSS	–	–95.7	–	dBm
	5.5 Mbps DSSS	–	–94.1	–	dBm
	11 Mbps DSSS	–	–90.4	–	dBm
RX sensitivity IEEE 802.11g (10% PER for 1024 octet PSDU)	6 Mbps OFDM	–	–95.0	–	dBm
	9 Mbps OFDM	–	–94.3	–	dBm
	12 Mbps OFDM	–	–93.5	–	dBm
	18 Mbps OFDM	–	–90.6	–	dBm
	24 Mbps OFDM	–	–87.4	–	dBm
	36 Mbps OFDM	–	–84.1	–	dBm
	48 Mbps OFDM	–	–79.3	–	dBm
	54 Mbps OFDM	–	–77.9	–	dBm
RX sensitivity IEEE 802.11n (10% PER for 4096 octet PSDU) <sup>1</sup> Defined for default parameters: 800 ns GI and non-STBC.	20 MHz channel spacing for all MCS rates				
	MCS0	–	–94.5	–	dBm
	MCS1	–	–91.9	–	dBm
	MCS2	–	–90.1	–	dBm
	MCS3	–	–89.5	–	dBm
	MCS4	–	–83.0	–	dBm
	MCS5	–	–78.3	–	dBm
	MCS6	–	–76.4	–	dBm
	MCS7	–	–74.4	–	dBm



### WLAN 2.4GHz Receiver Performance Specifications(Cont.)

Parameter	Condition/Notes	Min	Typ	Max	Unit
RX sensitivity IEEE 802.11an with LDPC (10% PER for 4096 octet PSDU) at RF port. Defined for default parameters: 800 ns GI.	20 MHz channel spacing for all MCS rates				
	MCS7	-	-77.6	-	dBm
Blocking level for 3 dB RX sensitivity degradation (without external filtering) <sup>2</sup>	<b>776-794 MHz (CDMA2000):</b>				
	Blocker frequency = 794 MHz	-	-16	-	dBm
	<b>824-849 MHz<sup>3</sup> (cdmaOne):</b>				
	Blocker frequency = 849 MHz	-	-11	-	dBm
	<b>824-849 MHz (GSM850):</b>				
	Blocker frequency = 849 MHz	-	-11	-	dBm
	<b>880-915 MHz (E-GSM):</b>				
	Blocker frequency = 915 MHz	-	-11	-	dBm
	<b>1710-1785 MHz (GSM1800):</b>				
	Blocker frequency = 1785 MHz	-	-12	-	dBm
	<b>1850-1910 MHz (GSM1900):</b>				
	Blocker frequency = 1910 MHz	-	-13	-	dBm
	<b>1850-1910 MHz (cdmaOne):</b>				
	Blocker frequency = 1910 MHz	-	-5	-	dBm
	<b>1850-1910 MHz (WCDMA):</b>				
	Blocker frequency = 1910 MHz	-	-19	-	dBm
	<b>1920-1980 MHz (WCDMA):</b>				
	Blocker frequency = 1980 MHz	-	-19	-	dBm
	<b>2300-2400 MHz (LTE band 40):</b>				
	Blocker frequency = 2300 MHz	-	-29	-	dBm
	Blocker frequency = 2365 MHz	-	-35	-	dBm
	<b>2500-2570 MHz (LTE band 7):</b>				
	Blocker frequency = 2505 MHz	-	-39	-	dBm
	Blocker frequency = 2565 MHz	-	-35	-	dBm
	<b>2570-2620 MHz (LTE band 38):</b>				
	Blocker frequency = 2575 MHz	-	-35	-	dBm
	<b>2496-2690 MHz (LTE band 41):</b>				
	Blocker frequency = 2501 MHz	-	-42	-	dBm
	Blocker frequency = 2685 MHz	-	-17	-	dBm
	<b>2545-2575 MHz (XGP Band):</b>				
	Blocker frequency = 2550 MHz	-	-33	-	dBm
In-band static CW jammer immunity ( $f_{jc} = 8 \text{ MHz} < f_{cw} < + 8 \text{ MHz}$ )	RX PER < 1%, 54 Mbps OFDM, 1000 octet PSDU for: ( $R_{xSens} + 23 \text{ dB} < R_{xlevel} < \text{max}$ )	-80	-	-	dBm
Input In-Band IP3	Maximum LNA gain	-	-10	-	dBm
	Minimum LNA gain	-	5	-	dBm
Maximum Receive Level @ 2.4 GHz	@ 1, 2 Mbps (8% PER, 1024 octets)	-3.5	-	-	dBm
	@ 5.5, 11 Mbps (8% PER, 1024)	-9.5	-	-	dBm
	@ 6-54 Mbps (10% PER, 1024)	-9.5	-	-	dBm
	@ MCS0-MCS7 rates (10% PER, 1095 octets)	-9.5	-	-	dBm

### WLAN 2.4GHz Receiver Performance Specifications(Cont.)

Parameter	Condition/Notes	Min	Typ	Max	Unit
Adjacent channel rejection-DSSS (Difference between interfering and desired signal at 8% PER for 1024 octet PSDU with desired signal level as specified in Condition/Notes)	Desired and interfering signal 30 MHz apart				
	1 Mbps DSSS -74 dBm	35	-	-	dB
	2 Mbps DSSS -74 dBm	35	-	-	dB
	Desired and interfering signal 25 MHz apart				
	5.5 Mbps -70 dBm	35	-	-	dB
	11 Mbps DSSS -70 dBm	35	-	-	dB
Adjacent channel rejection-OFDM (Difference between interfering and desired signal (25 MHz apart) at 10% PER for 1024 octet PSDU with desired signal level as specified in Condition/Notes)	6 Mbps OFDM -79 dBm	16	-	-	dB
	9 Mbps OFDM -78 dBm	15	-	-	dB
	12 Mbps OFDM -76 dBm	13	-	-	dB
	18 Mbps OFDM -74 dBm	11	-	-	dB
	24 Mbps OFDM -71 dBm	8	-	-	dB
	36 Mbps OFDM -67 dBm	4	-	-	dB
	48 Mbps OFDM -63 dBm	0	-	-	dB
	54 Mbps OFDM -62 dBm	-1	-	-	dB
Adjacent channel rejection MCS0-MCS7 (Difference between interfering and desired signal (25 MHz apart) at 10% PER for 4096 octet PSDU with desired signal level as specified in Condition/Notes)	MCS0 -79 dBm	16	-	-	dB
	MCS1 -76 dBm	13	-	-	dB
	MCS2 -74 dBm	11	-	-	dB
	MCS3 -71 dBm	8	-	-	dB
	MCS4 -67 dBm	4	-	-	dB
	MCS5 -63 dBm	0	-	-	dB
	MCS6 -62 dBm	-1	-	-	dB
	MCS7 -61 dBm	-2	-	-	dB
Maximum receiver gain	-	-	70	-	dB
Gain control step	-	-	3	-	dB
RSSI accuracy <sup>4</sup>	Range -95 <sup>5</sup> dBm to -30 dBm	-5	-	5	dB
	Range above -30 dBm	-8	-	8	dB
Return loss	Z <sub>0</sub> = 50Ω across the dynamic	10	11.5	13	dB
Receiver cascaded noise figure	At maximum gain	-	4	-	dB

### WLAN 2.4GHz Transmitter Performance Specifications

Parameter	Condition/Notes	Min	Typ	Max	Unit	
Frequency range	–	2400	–	2500	MHz	
Transmitted power in cellular and bands (at +21 dBm, 100% duty cycle, 1 Mbps CCK) <sup>1</sup>	776-794 MHz (CDMA2000)	–	–164	–	dBm/Hz	
	869-960 MHz (cdmaOne)	–	–163	–	dBm/Hz	
	1450-1495 (DAB)	–	–153.6	–	dBm/Hz	
	1570-1580 MHz (GPS)	–	–151.2	–	dBm/Hz	
	1592-1610 MHz (GLONASS)	–	–150.4	–	dBm/Hz	
	1710-1800 (DSC-1800-Uplink)	–	–145	–	dBm/Hz	
	1805-1880 MHz (GSM 1800)	–	–139	–	dBm/Hz	
	1850-1910 MHz (GSM 1900)	–	–139	–	dBm/Hz	
	1910-1930 MHz (TDSCDMA, LTE)	–	–140	–	dBm/Hz	
	1930-1990 MHz (GSM1900, cdmaOne, WCDMA)	–	–128	–	dBm/Hz	
	2010-2075 MHz (TDSCDMA)	–	–131	–	dBm/Hz	
	2110-2170 MHz (WCDMA)	–	–125	–	dBm/Hz	
	2305-2370 (LTE band 40)	–	–95	–	dBm/Hz	
	2370-2400 (LTE band 40)	–	–80	–	dBm/Hz	
	2496-2530 (LTE band 41)	–	–80	–	dBm/Hz	
	2530-2560 (LTE band 41)	–	–110	–	dBm/Hz	
	2570-2690 (LTE band 41)	–	–116	–	dBm/Hz	
	5000-5900 (WLAN 5G)	–	–155	–	dBm/Hz	
EVM Does Not Exceed						
TX power at the chip port for highest power level setting at 25°C and VBAT = 3.6V with spectral mask and EVM compliance	802.11b (DSSS/CCK)	–9 dB	–	+20.5	–	dBm
	OFDM, BPSK	–8 dB	–	+19.5	–	dBm
	OFDM, 64QAM	–25 dB	–	+18	–	dBm
	MCS7	–27 dB	–	+17	–	dBm
Phase noise	37.4 MHz crystal, integrated from 10 kHz to 10 MHz		–	0.45	–	Degrees
TX power control dynamic range	–	10	–	–	–	dB
Closed-loop TX power variation at highest power level setting	Across full temperature and voltage range. Applies to 10 dBm to 20 dBm output power range.		–	–	±1.5	dB
Carrier suppression	–	15	–	–	–	dBc
Gain control step	–	–	0.25	–	–	dB
Return loss at Chip port TX	Z <sub>0</sub> = 50Ω		–	6	–	dB



## 5GHz Band RF Specifications

### WLAN 5GHz Receiver Performance Specifications

Parameter	Condition/Notes	Min	Typ	Max	Unit
Frequency range	–	4900	–	5845	MHz
RX sensitivity IEEE 802.11a (10% PER for 1000 octet PSDU)	6 Mbps OFDM	–	–93.5	–	dBm
	9 Mbps OFDM	–	–92.5	–	dBm
	12 Mbps OFDM	–	–91.7	–	dBm
	18 Mbps OFDM	–	–89.1	–	dBm
	24 Mbps OFDM	–	–85.9	–	dBm
	36 Mbps OFDM	–	–82.6	–	dBm
	48 Mbps OFDM	–	–77.6	–	dBm
	54 Mbps OFDM	–	–76.4	–	dBm
RX sensitivity IEEE 802.11n (10% PER for 4096 octet PSDU) Defined for default parameters: 800 ns GI and non-STBC.	20 MHz channel spacing for all MCS rates				
	MCS0	–	–93.0	–	dBm
	MCS1	–	–90.5	–	dBm
	MCS2	–	–88.0	–	dBm
	MCS3	–	–84.6	–	dBm
	MCS4	–	–81.5	–	dBm
	MCS5	–	–76.8	–	dBm
	MCS6	–	–74.9	–	dBm
	MCS7	–	–72.9	–	dBm
RX sensitivity IEEE 802.11n (10% PER for 4096 octet PSDU) Defined for default parameters: 800 ns GI and non-STBC.	40 MHz channel spacing for all MCS rates				
	MCS0	–	–91.0	–	dBm
	MCS1	–	–88.0	–	dBm
	MCS2	–	–85.5	–	dBm
	MCS3	–	–82.2	–	dBm
	MCS4	–	–78.9	–	dBm
	MCS5	–	–74.3	–	dBm
	MCS6	–	–72.8	–	dBm
	MCS7	–	–71.2	–	dBm
RX sensitivity IEEE 802.11ac (10% PER for 4096 octet PSDU) Defined for default parameters: 800 ns GI and non-STBC.	20 MHz channel spacing for all MCS rates				
	MCS0 NSS1	–	–93.2	–	dBm
	MCS1 NSS1	–	–90.5	–	dBm
	MCS2 NSS1	–	–88.3	–	dBm
	MCS3 NSS1	–	–85.2	–	dBm
	MCS4 NSS1	–	–81.8	–	dBm
	MCS5 NSS1	–	–76.9	–	dBm
	MCS6 NSS1	–	–75.0	–	dBm
	MCS7 NSS1	–	–74.1	–	dBm
	MCS8 NSS1	–	–69.7	–	dBm



### WLAN 5GHz Receiver Performance Specifications(Cont.)

Parameter	Condition/Notes	Min	Typ	Max	Unit
RX sensitivity IEEE 802.11ac (10% PER for 4096 octet PSDU) Defined for default parameters: 800 ns GI and non-STBC.	40 MHz channel spacing for all MCS rates				
	MCS0 NSS1	–	–91.3	–	dBm
	MCS1 NSS1	–	–88.3	–	dBm
	MCS2 NSS1	–	–85.9	–	dBm
	MCS3 NSS1	–	–82.6	–	dBm
	MCS4 NSS1	–	–79.2	–	dBm
	MCS5 NSS1	–	–74.6	–	dBm
	MCS6 NSS1	–	–73.0	–	dBm
	MCS7 NSS1	–	–71.6	–	dBm
	MCS8 NSS1	–	–67.3	–	dBm
	MCS9 NSS1	–	–65.7	–	dBm
RX sensitivity IEEE 802.11ac (10% PER for 4096 octet PSDU) Defined for default parameters: 800 ns GI and non-STBC.	80 MHz channel spacing for all MCS rates				
	MCS0 NSS1	–	–88.0	–	dBm
	MCS1 NSS1	–	–85.0	–	dBm
	MCS2 NSS1	–	–82.3	–	dBm
	MCS3 NSS1	–	–79.1	–	dBm
	MCS4 NSS1	–	–75.8	–	dBm
	MCS5 NSS1	–	–71.2	–	dBm
	MCS6 NSS1	–	–69.9	–	dBm
	MCS7 NSS1	–	–68.2	–	dBm
	MCS8 NSS1	–	–64.2	–	dBm
	MCS9 NSS1	–	–62.6	–	dBm
RX sensitivity IEEE 802.11ac 20/40/ 80 MHz channel spacing with LDPC (10% PER for 4096 octet PSDU) at RF port. Defined for default parameters: 800 ns GI, LDPC coding and non-STBC.	MCS7 NSS1	20 MHz	–	–75.8	dBm
	MCS8 NSS1	20 MHz	–	–71.9	dBm
	MCS7 NSS1	40 MHz	–	–73.8	dBm
	MCS8 NSS1	40 MHz	–	–69.9	dBm
	MCS9 NSS1	40 MHz	–	–67.9	dBm
	MCS7 NSS1	80 MHz	–	–70.5	dBm
	MCS8 NSS1	80 MHz	–	–66.6	dBm
	MCS9 NSS1	80 MHz	–	–64.5	dBm

### WLAN 5GHz Receiver Performance Specifications(Cont.)

Parameter	Condition/Notes	Min	Typ	Max	Unit
Blocking level for 3 dB RX sensitivity degradation (without external filtering) <sup>1</sup>	<b>776-794 MHz (CDMA2000):</b>				
	Blocker frequency = 794 MHz	-	-21	-	dBm
	<b>824-849 MHz<sup>2</sup> (cdmaOne):</b>				
	Blocker frequency = 849 MHz	-	-20	-	dBm
	<b>824-849 MHz (GSM850):</b>				
	Blocker frequency = 849 MHz	-	-10	-	dBm
	<b>880-915 MHz (E-GSM):</b>				
	Blocker frequency = 915 MHz	-	-12	-	dBm
	<b>1710-1785 MHz (GSM1800):</b>				
	Blocker frequency = 1785 MHz	-	-13	-	dBm
	<b>1850-1910 MHz (GSM1900):</b>				
	Blocker frequency = 1910 MHz	-	-13	-	dBm
	<b>1850-1910 MHz (cdmaOne):</b>				
	Blocker frequency = 1910 MHz	-	-18	-	dBm
	<b>1850-1910 MHz (WCDMA):</b>				
	Blocker frequency = 1910 MHz	-	-20	-	dBm
	<b>1920-1980 MHz (WCDMA):</b>				
	Blocker frequency = 1980 MHz	-	-20	-	dBm
	<b>2300-2400 MHz (LTE band 40)</b>				
	Blocker frequency = 2395 MHz	-	-19	-	dBm
	<b>2500-2570 MHz (LTE band 7):</b>				
	Blocker frequency = 2565 MHz	-	-16	-	dBm
	<b>2570-2620 MHz (LTE band 38):</b>				
	Blocker frequency = 2615 MHz	-	-16	-	dBm
	<b>2496-2690 MHz (LTE band 41):</b>				
	Blocker frequency = 2685 MHz	-	-16	-	dBm
	<b>2545-2575 MHz (XGP Band):</b>				
	Blocker frequency = 2570 MHz	-	-18	-	dBm
Input In-Band IP3	Maximum LNA gain	-	-11	-	dBm
	Minimum LNA gain	-	5	-	dBm
Maximum receive level @ 5.24 GHz	@ 6, 9, 12 Mbps	-	-	-	dBm
	@ 18, 24, 36, 48, 54 Mbps	-	-	-	dBm

### WLAN 5GHz Receiver Performance Specifications(Cont.)

Parameter	Condition/Notes	Min	Typ	Max	Unit
Adjacent channel rejection (Difference between interfering and desired signal (20 MHz apart) at 10% PER for 1000 octet PSDU with desired signal level as specified in Condition/Notes)	6 Mbps OFDM	-79 dBm	16	-	dB
	9 Mbps OFDM	-78 dBm	15	-	dB
	12 Mbps OFDM	-76 dBm	13	-	dB
	18 Mbps OFDM	-74 dBm	11	-	dB
	24 Mbps OFDM	-71 dBm	8	-	dB
	36 Mbps OFDM	-67 dBm	4	-	dB
	48 Mbps OFDM	-63 dBm	0	-	dB
	54 Mbps OFDM	-62 dBm	-1	-	dB
	65 Mbps OFDM	-61 dBm	-2	-	dB
Alternate adjacent channel rejection (Difference between interfering and desired signal (40 MHz apart) at 10% PER for 1000 <sup>3</sup> octet PSDU with desired signal level as specified in Condition/Notes)	6 Mbps OFDM	-78.5 dBm	32	-	dB
	9 Mbps OFDM	-77.5 dBm	31	-	dB
	12 Mbps OFDM	-75.5 dBm	29	-	dB
	18 Mbps OFDM	-73.5 dBm	27	-	dB
	24 Mbps OFDM	-70.5 dBm	24	-	dB
	36 Mbps OFDM	-66.5 dBm	20	-	dB
	48 Mbps OFDM	-62.5 dBm	16	-	dB
RSSI accuracy <sup>4</sup>	Range -98 dBm to -30	-5	-	5	dB
	Range above -30 dBm	-8	-	8	dB
Return loss	Z <sub>0</sub> = 50Ω across the dynamic range	10	-	13	dB
Receiver cascaded noise figure	At maximum gain	-	5	-	dB
Maximum receiver gain	-	-	65	-	dB
Gain control step	-	-	3	-	dB



### WLAN 5GHz Transmitter Performance Specifications

Parameter	Condition/Notes	Min	Typ	Max	Unit
Frequency range	–	4900	–	5845	MHz
Transmitted power in cellular and bands (at +18.5 dBm, 100% duty cycle, 6 Mbps OFDM) <sup>1</sup>	776–794 MHz (CDMA2000)	–	–164	–	dBm/Hz
	869–960 MHz (cdmaOne, GSM850)	–	–166	–	dBm/Hz
	1450–1495 (DAB)	–	–166	–	dBm/Hz
	1570–1580 MHz (GPS)	–	–166	–	dBm/Hz
	1592–1610 MHz (GLONASS)	–	–165.5	–	dBm/Hz
	1710–1800(DSC-1800-Uplink)	–	–135	–	dBm/Hz
	1805–1880 MHz (GSM 1800)	–	–165	–	dBm/Hz
	1850–1910 MHz (GSM 1900)	–	–165	–	dBm/Hz
	1910–1930 MHz (TDSCDMA, LTE)	–	–165	–	dBm/Hz
	1930–1990 MHz (GSM1900, cdmaOne, WCDMA)	–	–165	–	dBm/Hz
	2010–2075 MHz (TDSCDMA)	–	–164.5	–	dBm/Hz
	2110–2170 MHz (WCDMA)	–	–164	–	dBm/Hz
	2305–2370 (LTE band 40)	–	–160	–	dBm/Hz
	2370–2400 (LTE band 40)	–	–163	–	dBm/Hz
	2400–2500 (WLAN 2G)	–	–160	–	dBm/Hz
	2496–2530 (LTE band 41)	–	–161.5	–	dBm/Hz
	2530–2560 (LTE band 41)	–	–161.5	–	dBm/Hz
	2570–2690 (LTE band 41)	–	–161	–	dBm/Hz

## 4. Certification Information

**Model:** SBW-M3

**Product Marketing Name:** WiFi/BT Combo Module

**FCC:** WF5SBWM3

**IC:** 9080A-SBWM3

**KC:** R-R-SWP-SBWM3

**Anatel:** 07424-20-01395



**Manufacturer:** Aroot Co., Ltd.

**Address:** 28-6 Gajangsaneopdong-ro, Osan-si,  
Gyeonggi-do, 18103, Republic of Korea

**Tel:** +82-31-8077-5000

**Fax:** +82-31-624-5310

### ● Product Label

