WD-MSO

2.4GHz/5GHz
WLAN(IEEE 802.11a/b/g/n)
Stand-alone Module

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1. Application

This specification is applied to the 2.4GHz/5GHz WLAN(802.11a/b/g/n) Stand-Alone module of

 BIXOLON

2. Quality

Quality should meet each condition which are mentioned on this specification. However, items which are not mentioned on this specification should follow the inspection agreements and standards which are agreed with both companies.

3. Appearance and Characteristics

3.1 Appearance

Appearance should not be contaminated by harmful materials and have cracks etc.
Mechanical dimension should meet the contents of clause 7.

3.2 Characteristics

Electrical characteristics should meet the contents of clause 12.

4. Application of 2.4GHz/5GHz WLAN(802.11a/b/g/n) Stand-Alone Module

WD-MSO is a 2.4GHz/5Ghz WLAN(802.11a/b/g/n) Stand-Alone Module for IoT(Internet of Things) such as Home electronic appliance, Room controller, Smart plug, etc. But, this module is not designed for Life Support Application.

Also it is recommended that this module should be mounted by reflow soldering.

5. Absolute Maximum Rating

		Min.	Max.	Unit
Storage Temperature		-40	+85	deg.C
Supply Voltage	VBAT_A, B	-0.5	+4.6	V
	VDDIO_1,2,RF	-0.5	+4.0	
	VDD_MEM	-0.5	+4.0	
	VDD_FEM	-0.3	+5.0	

6. Test

Electrical characteristics are tested for every product. However, if there are any objections in judgment, it should be treated with agreements of companies.

7. Mechanical Dimension

Dimension	mm× mm × mm(Max.)

Figure 1 and Figure 2 show the Bottom Layer (Top View) and the side dimension of WD-MSO package outline
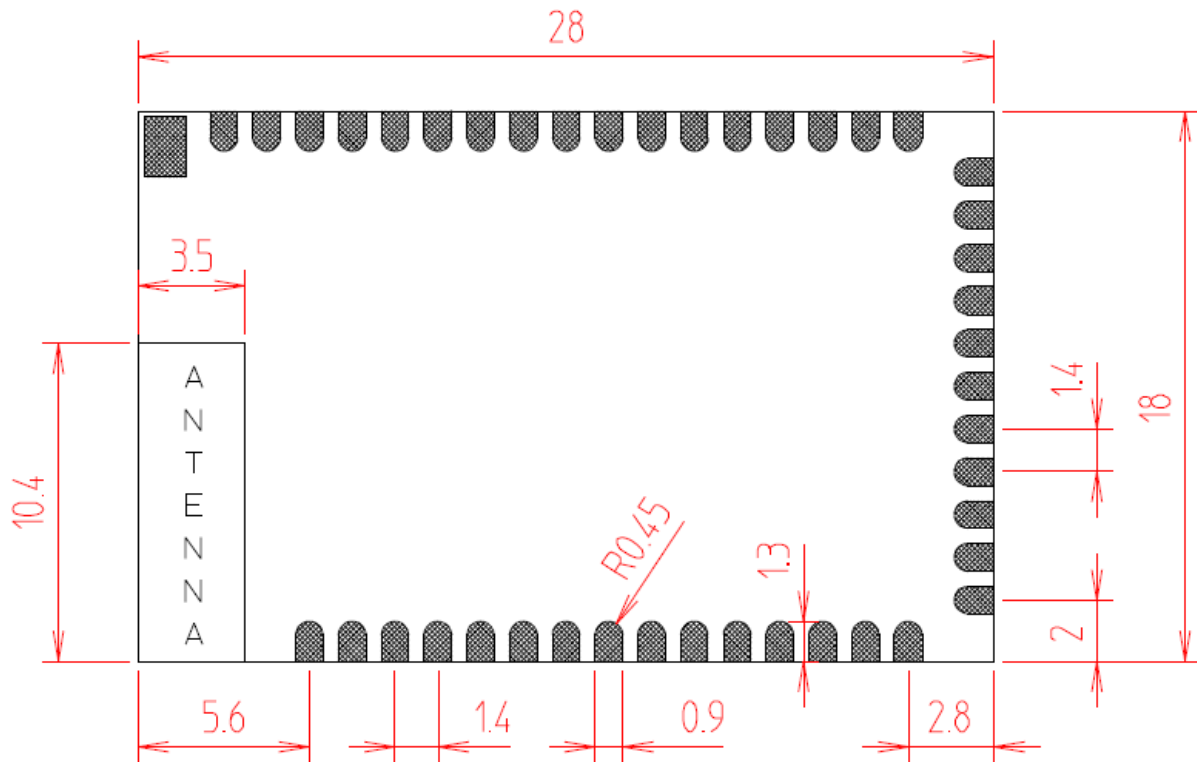

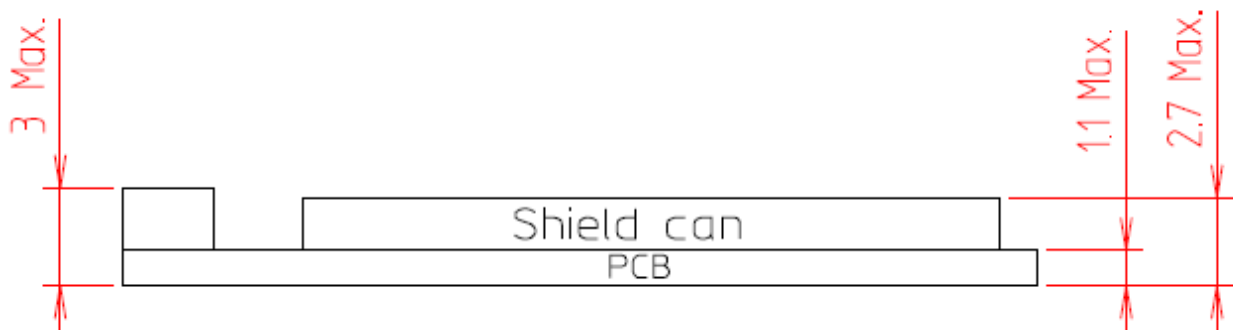**Figure 1. Package Outline (Top View)**

Figure 2. Package Outline (Side View)

8. General Description

WD-MSO is a compact size and low power System-in-Package (SiP) for 2.4GHz/5GHz WLAN(802.11a/b/g/n) aimed at embedded and IOT applications.

WD-MSO can be available as 3~46 pin. (28mm x 18mm x Max. 3.0mm)

9. External Clock Reference

9.1 External LPO Signal Requirement

Parameters	External LPO Clock	Unit
Nominal input frequency	32.768	kHz
Frequency accuracy	±200	ppm
Input signal amplitude*	VDDIO	mVp-p
Signal type	Square-wave or sine-wave	-
Input impedance	> 100k < 5 When power is applied or power is off	Ω pF

10. Input/Output DC Terminal Characteristics

	Parameters	Conditions	Min.	Typ.	Max.	Unit
V_{IH}	High Level Input Voltage	VDDIO=3.3V	0.7xVDDIO			V
V_{IL}	Low Level Input Voltage	VDDIO=3.3V			0.3xVDDIO	V
V_{OH}	High Level Output Voltage	@100uA, 3.3V	VDDIO-0.3			V
		@2mA, 3.3V	VDDIO-0.35			V
V_{OL}	Low Level Output Voltage	@100uA, 3.3V			0.4	V
		@2mA, 3.3V			0.4	V
C_{IN}	Input Capacitance				5	pF

11. Electrical Characteristics

11.1 Operating Condition\

		Min.	Typ.	Max.	Unit
Operating Temperature		-30	25	+85	deg.C
Supply Voltage	VBAT_A,B	3.3	3.6	4.5	V
	VDDIO_1,2,RF	3.0	3.3	3.6	
	VDD_MEM	3.0	3.3	3.6	
	VDD_FEM	3.2	3.6	4.4	

* The optimal RF performance specified in this datasheet is guaranteed for temperatures from -20℃~+70℃

11.2 2.4GHz Tx Characteristics

All measurements are made under nominal supply voltage,

(VBAT_A,B = 3.3V, VDDIO_1,2, RF=3.3V, VDD_MEM=3.3V) and room temperature (25℃)condition.

Parameters	Conditions	Spec.			
		Min.	Typ.	Max.	Unit
Frequency Range		2400	-	2500	MHz
Output Power (VBAT=3.3V, spectral mask, EVM compliance)	802. 11b, EVM = -9 dB		16.5		dBm
	OFDM , BPSK, EVM = -8 dB		15		
	OFDM, QPSK, EVM = -13 dB		15		
	OFDM, 16QAM, EVM = -19 dB		15		
	OFDM, 64QAM [3/4], EVM = -25 dB		13		
	OFDM, 64QAM [5/6], EVM = -28 dB		13		

11.3 2.4Ghz Rx Characteristics

All measurements are made under nominal supply voltage,

(VBAT_A,B = 3.3V, VDDIO_1,2, RF=3.3V, VDD_MEM=3.3V) and room temperature (25℃)condition.

Parameters	Conditions	Spec.			
		Min.	Typ.	Max.	Unit
Frequency Range		2400	-	2500	MHz
11b, Rx Sensitivity (8% PER for 1024 octet PSDU)	CCK, 1 Mbps		-96.5		dBm
	CCK, 2 Mbps		-94.5		
	CCK, 5.5 Mbps		-92.5		
	CCK, 11 Mbps		-89.5		
11g, Rx Sensitivity (10% PER for 1024 octet PSDU)	OFDM, 6 Mbps		-93.5		
	OFDM, 9 Mbps		-91.5		
	OFDM, 12 Mbps		-90.5		
	OFDM, 18 Mbps		-88.5		
	OFDM, 24 Mbps		-86.5		
	OFDM, 36 Mbps		-82.5		
	OFDM, 48 Mbps		-79.5		
	OFDM, 54 Mbps		-77.5		
11n, Rx Sensitivity (10% PER for 4096 octet PSDU)	HT20, MCS0		-93.5		
	HT20, MCS1		-89.5		
	HT20, MCS2		-87.5		
	HT20, MCS3		-84.5		
	HT20, MCS4		-81.5		
	HT20, MCS5		-77.5		
	HT20, MCS6		-76.5		
	HT20, MCS7		-74.5		
Adjacent	CCK, 1 Mbps (signal; -74dBm)	35	-		dB

Channel Rejection	CCK, 11 Mbps (signal; -70dBm)	35	-		
	OFDM, 6 Mbps (signal; -79dBm)	16	-		
	OFDM, 54 Mbps (signal; -62dBm)	-1	-		
Max Input level	11b 1M,2M		0		dBm
	11b 5.5M, 11M		0		
	11g		-10		
	11n		-10		

11.4 5GHz band Tx Characteristics

All measurements are made under nominal supply voltage,

(VBAT_A,B = 3.3V, VDDIO_1,2, RF=3.3V, VDD_MEM=3.3V, VDD_FEM=3.3V) and room temperature (25℃)condition

| Parameters	Conditions	Spec.			
		Min.	Typ.	Max.	Unit
Frequency Range		4900	-	5845	MHz
Output Power (VBAT, VDD_FEM=3.3V, spectral mask, EVM compliance)	11a, OFDM, 64QAM 3/4, EVM = -25 dB		13		dBm
	11n, OFDM, 64QAM 5/6, EVM = -28 dB		13		

11.5 5GHz Rx Characteristics

All measurements are made under nominal supply voltage,

(VBAT_A,B = 3.3V, VDDIO_1,2, RF=3.3V, VDD_MEM=3.3V, VDD_FEM=3.3V) and room temperature (25℃)condition

Parameters	Conditions	Spec.			
		Min.	Typ.	Max.	Unit
Frequency Range		4900	-	5845	MHz
11a, Rx Sensitivity (10% PER for 1024 octet PSDU)	OFDM, 6 Mbps		-92.5		dBm
	OFDM, 9 Mbps		-90.5		
	OFDM, 12 Mbps		-89.5		
	OFDM, 18 Mbps		-87.5		
	OFDM, 24 Mbps		-84.5		
	OFDM, 36 Mbps		-81.5		
	OFDM, 48 Mbps		-77.5		
	OFDM, 54 Mbps		-76		
11n, Rx Sensitivity (10% PER for 4096 octet PSDU)	HT20, MCS0		-91.5		
	HT20, MCS1		-89.5		
	HT20, MCS2		-86		
	HT20, MCS3		-83		
	HT20, MCS4		-80		
	HT20, MCS5		-75.5		
	HT20, MCS6		-73.5		
	HT20, MCS7		-73		
Adjacent Channel Rejection	11a, OFDM, 54Mbps (Signal : -62dBm)	-1			dBm

	11n, HT20, MCS7 (Signal : -61dBm)	-2		
Max Input level	11a/n		-20		dBm

12. Pin Assignment (Top View, Bottom Layer)
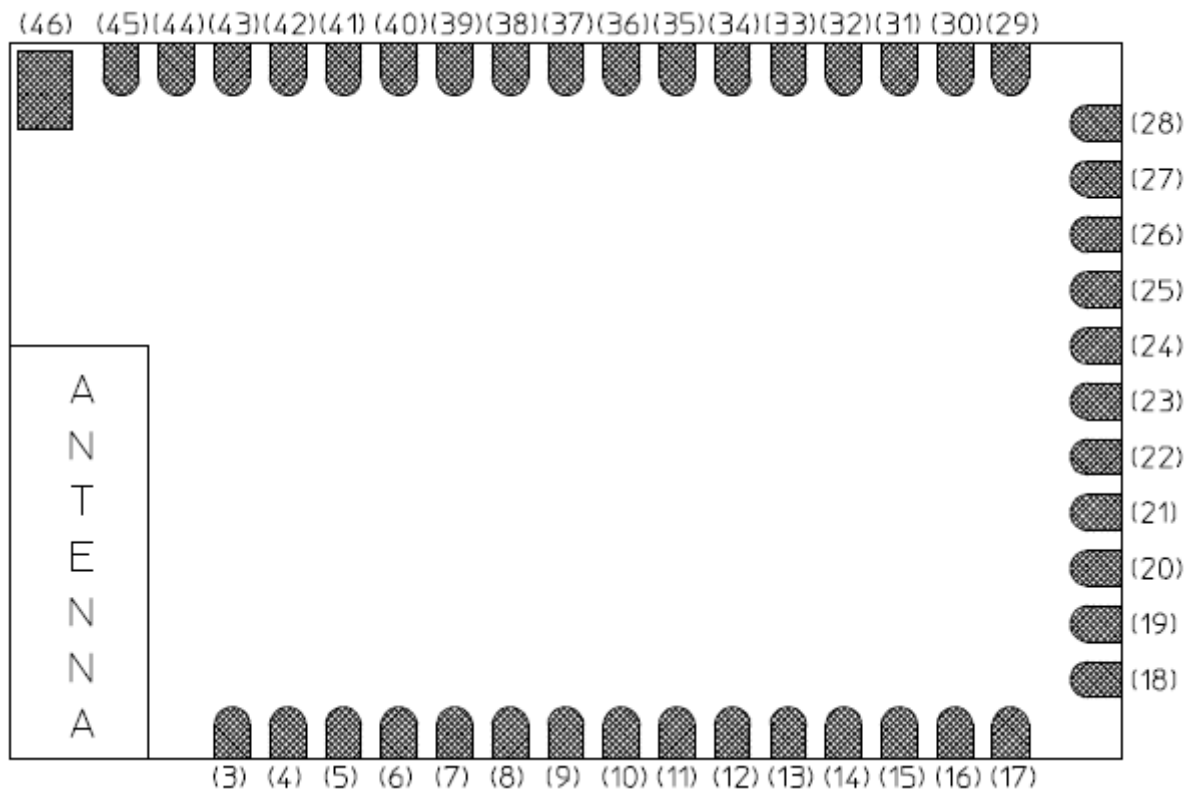
No.	Pin Name	No.	Pin Name	No.	Pin Name
3	GND	19	GP12	35	SD_D1
4	GND	20	GND	36	GND
5	GND	21	GP13	37	SPI_MISO
6	GND	22	VBAT_B	38	SPI_CS
7	VDDIO_1	23	CLK_RTC	39	GND
8	RSTN	24	GP09	40	GP11
9	GP14	25	GP08	41	GP10
10	SF_SEL	26	NC	42	GND
11	VDDIO_2	27	NC	43	GND
12	JTAG_SEL	28	VDD_MEM	44	N/C
13	VDDIO_RF	29	GND	45	GND
14	VBAT_A	30	SD_D2	46	GND
15	GND	31	SD_D3		
16	GND	32	SD_CMD		
17	GND	33	SD_CLK		

| 18 | PMIC_EN | 34 | SD_D0 | | |

13. Pin Description

Pin Num.	Pin Name	Description
3	GND	Module Ground
4	GND	
5	GND	
6	GND	
7	VDDIO_1	GP5~GP15 IO PWR(JTAG, SDIO etc)
8	RSTN	RESET input
9	GP14	Factory Reset input, Before 5GHz LNA Control output
10	SF_SEL	Serial Flash boot select
11	VDDIO_2	GP5~GP15 IO PWR(JTAG, SDIO etc)
12	JTAG_SEL	JTAG Debug select
13	VDDIO_RF	GP00/GP01 IO PWR(Internal RF SW control)GP02/GP03 IO PWR
14	VBAT_A	Internal 1.4V DC_DC POWER input(3.3V~4.7V)
15	GND	Module Ground
16	GND	
17	GND	
18	PMIC_EN	INTERNAL PMIC PWR EN
19	GP12	UART2 TXD/GPIO
20	GND	UART2 CTS/GPIO
21	GP13	UART2 RXD/GPIO
22	VBAT_B	Internal 2.5V LDO, 3.3V LDO POWER input(3.3V~4.7V)
23	CLK_RTC	Low speed clock input
24	GP09	UART0 RXD/GPIO
25	GP08	UART0 TXD/GPIO
26	NC	Not connected (Internal SF_SIO0)
27	NC	Not connected (Internal SF_SCLK)
28	VDD_MEM	Internal Flash Memory Power input
29	GND	Module Ground
30	SD_D2	SDIO Data 2
31	SD_D3	SDIO Data 3/SDIO SPI Mode CS
32	SD_CMD	SD CMD/SDIO SPI Mode DI

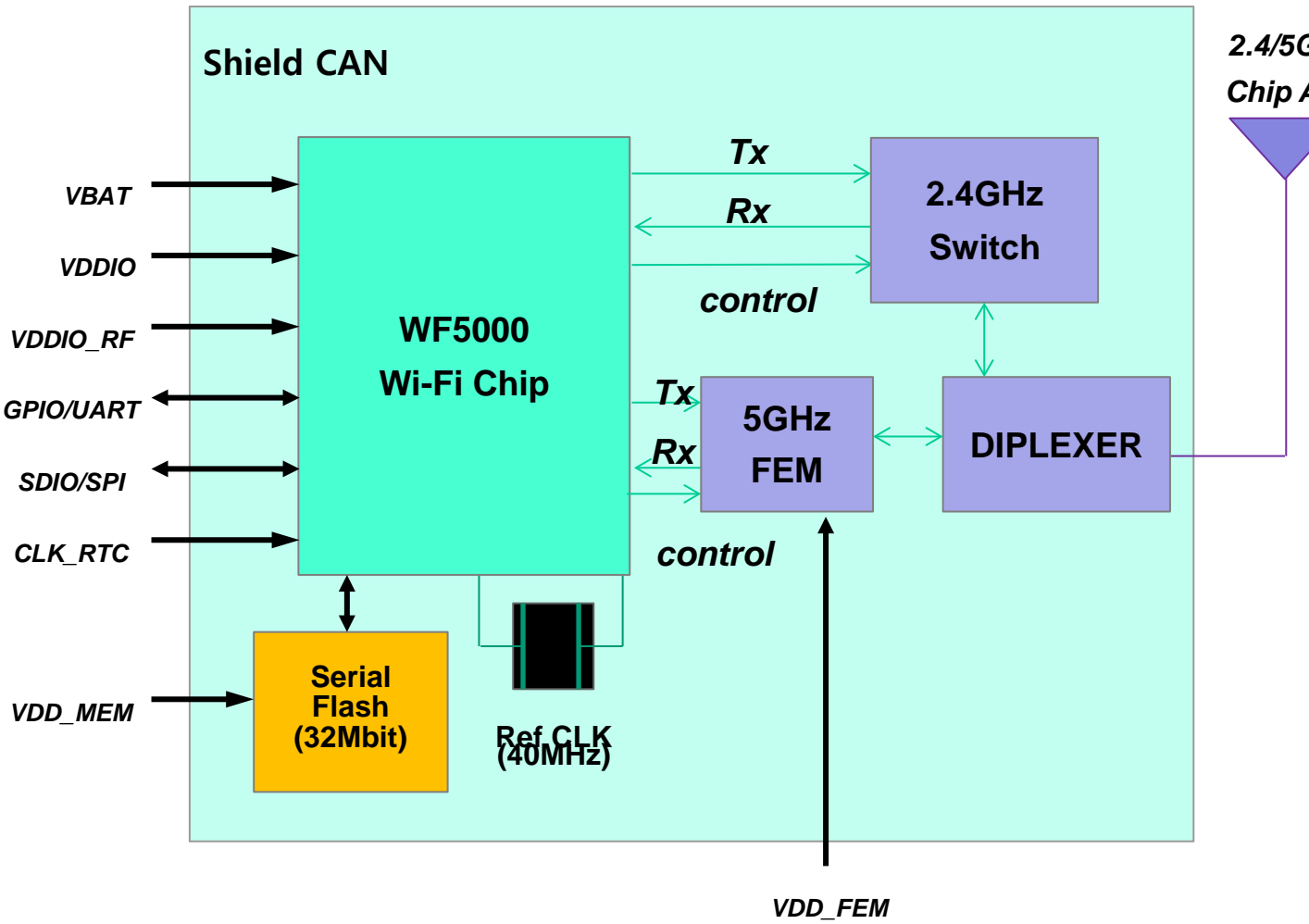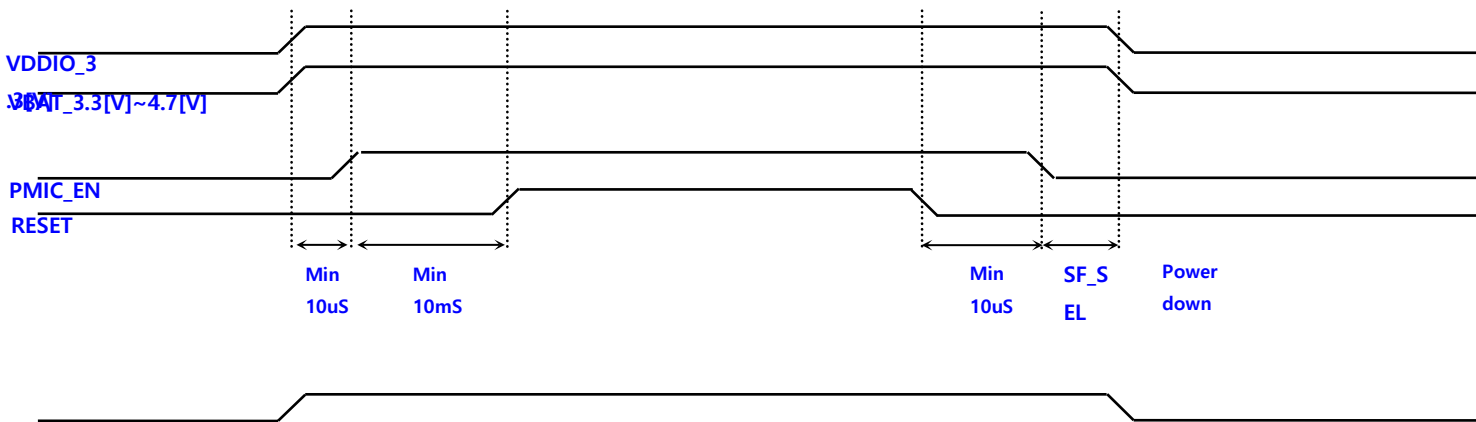| 33	SD_CLK	SDIO Clock (~50 MHz)/SDIO SPI Mode CLK(~50MHz)
34	SD_D0	SD Data 0/SDIO SPI Mode DO
35	SD_D1	SD Data 1/SDIO SPI Mode IRQ
36	GND	Module Ground
37	GP05	SPI_MISO
38	GP07	SPI_CS
39	GND	Module Ground
40	GP11	UART1 TXD/GPIO
41	GP10	UART1 RXD/GPIO
42	GND	Module Ground
43	GND	
44	NC	Not connected
45	GND	Module Ground
46	GND	

14. Block Diagram

Figure 3. Block Diagram

15. Power Sequence

※ **When VCC is below 3.0V, it must be reset.**

16.Revision History

Ver.	Comment	Date	Author	Approver
0.1	Initial release	Nov,18,2016	Y.S.SEO	

17. Warning Statements

<FCC Warning Statements>

FCC Part 15.19 Statements:

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.

FCC Part 15.105 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.

FCC Part 15.21 statement

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

RF Exposure Statement

The antenna(s) must be installed such that a minimum separation distance of at least 20 cm is

maintained between the radiator (antenna) and all persons at all times. This device must not be co-located or operating in conjunction with any other antenna or transmitter.

End Product Labeling

The module is labeled with its own FCC ID and IC Certification Number. If the FCC ID and IC

Certification Number are not visible when the module is installed inside another device, then the

outside of the device into which the module is installed must also display a label referring to the

enclosed module. In that case, the final end product must be labeled in a visible area with the

following:

″Contains FCC ID: 2AKMF-WD-MSO″

″Contains IC: 22266-WDMSO″

RSS-GEN, Sec. 8.4– (licence-exempt radio apparatus)

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.

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.

RF Exposure

The antenna (or antennas) must be installed so as to maintain at all times a distance minimum of at least 20 cm between the radiation source (antenna) and any individual. This device may not be installed or used in conjunction with any other antenna or transmitter.

l'exposition aux RF

L'antenne (ou les antennes) doit être installée de façon à maintenir à tout instant une distance minimum de au moins 20 cm entre la source de radiation (l'antenne) et toute personne physique.

Étiquetage du produit final (IC)

Le module BT111 est étiqueté avec sa propre identification FCC et son propre numéro de

certification IC. Si l'identification FCC et le numéro de certification IC ne sont pas visibles lorsque

le module est installé à l'intérieur d'un autre dispositif, la partie externe du dispositif dans lequel

le module est installé devra également présenter une étiquette faisant référence au module inclus.

Dans ce cas, le produit final devra être étiqueté sur une zone visible avec les informations

suivantes :

« Contient module émetteur identification FCC ID : 2AKMF-WD-MSO

« Contient module émetteur IC : 22266-WDMSO