Project No：BW16

Date：2019.08.16

Rev：V1.1

承 认 书

Customer name：_____

Model：_____BW16_____

B&T P/N:_____

Spec.：___Single-Chip low power dual bands Wireless LAN(WLAN)

___and Bluetooth Low Energy(v5.0)_____

Sealed by corporation:

Compilation	Verify	Approval
Wanghs		

Sealed by customer：

Check	Verify	Approval

Contact information of B&T：

ADD:10/F,Lingyun Administration Building,Liufang Road,The 67 District of Baoan District,Shenzhen Factory in Zhongshan：3-4/F A Building,The Eastern Industrial Zone,Nam Long,Zhongshan TEL：0760-88580932　　FAX：0760-89961414 HTTP：http://www.tech-now.com		
sales:	MB:	E-mail：
support :	MB:	E-mail：
Quality:	MB:	E-mail：

SPECIFICATION

Single-Chip low power dual bands

Wireless LAN(WLAN) and Bluetooth Low Energy(v5.0)

SoC Module

BW16

Version: V1.1

Change History of Revision

Revisio	Date	Contents of Revision Change	Compilation	Verify
V1.0	2019.06.13	Iinitial release	Wanghs	
V1.1	2019.08.16	Modify pin definitions	Wanghs	

1.Overview

The BW16 is a highly integrated Wi-Fi and Bluetooth SOC module ,Main chip RTL8720DN is a highly integrated Single-Chip low power dual bands(2.4GHz and 5GHz) Wireless LAN(WLAN) and Bluetooth Low Energy(v5.0). It consists of a high-per formance MCU(ARM V8M,Cortex-M4F instruction compatible) named KM4, a low power MCU(ARM V8M,Cortex-M0 instruction compatible) named KM0, WLAN (802.11 a/b/g/n) MAC, an 1T1R capable WLAN baseband, RF, Bluetooth and peripherals.

BW16 integrates internal memories for complete WIFI and BLE5.0 protocol functions. The embedded memory configuration also provides simple application developments.

2. Features
Wireless

Items	Description
WIFI	802.11 a/b/g/n 1x1, 2.4GHz & 5GHz - Support 20MHz/40MHz up to MCS7 - Low power architecture - Support low power Tx/Rx for short range application - Low power beacon listen mode - Low power Rx mode - Very low power suspends mode (DLPS) - External PA is supported
BT BLE	- Support BLE - Support both central and peripheral modes - High power mode (10dbm, share the same PA with WIFI) - Internal co-existence mechanism between WIFI and BT to share the same antenna.
BT BLE5.0	Support BLE5.0

Secure

Items	Description
Hardware engine	● AES/DES/SHA hardware engine
TrustZone	● TrustZone-M supported
Secure boot	● Secure boot supported
SWD protection	● Debug port access protection and prohibition modes
eFuse protection	● Security eFuse
RSIP	● Flash Decryption on-the-fly

Peripheral Interfaces

- 3 ADC interface are shared with the uart interfaces
- 2 UART with standard baud rate support
- 1 I2C   interfaces are shared with the PWM interfaces
- 1 SPI   interfaces are shared with the PWM interfaces
- 4 PWM interfaces
- All of the above interfaces can be used as GPIO

3. Applications

- BLE beacon
- Industrial wireless control
- Bluetooth gateway
- Wearable electronical devices
- Security ID tags
- Smart home

4. General Specification

Hardware Features	
Model	BW16
Antenna Type	IPEX connect or PCB Antenna
Major Chipset	RTL8720DN
Power Supply	3.3±5% V
Dimension	24 .0*16.0* 3.1mm (LxWxH) ±0.2mm
WIFI Wireless Features	
Wireless Standards	IEEE 802.11 a/b/g/n
Frequency Range	2.412-2.484GHz & 5.180-5.825GHz
Data Rates	802.11a : 6,9,12,18,24,36,48,54Mbps
	802.11b : 1,2,5.5,11Mbps
	802.11g : 6,9,12,18,24,36,48,54Mbps
	802.11n : MCS0--MCS7 @ HT20 /2.4GHz and 5GHz band
	MCS0--MCS7 @ HT40 /2.4GHz and 5GHz band
Modulation Technique	DSSS (DBPSK, DQPSK, CCK)
	OFDM (BPSK, QPSK, 16-QAM, 64-QAM)
Work Mode	AP, Station, AP/Client
Others	
Environment	Operating Temperature: -20℃~85℃
	Storage Temperature: -40℃~125℃
	Operating Humidity: 10%~90% (non-condensing)
	Storage Humidity: 5%~90% (non-condensing)
Certification	RoHS compliance、FCC、CE、SRRC
Bluetooth Wireless Features	
Wireless Standards	Bluetooth5.0 BLE
Frequency Range	2.402GHz -2.480GHz
Receive Sensitivity	-92dBm
Transmit Power	7±2dBm

5. Block Diagram
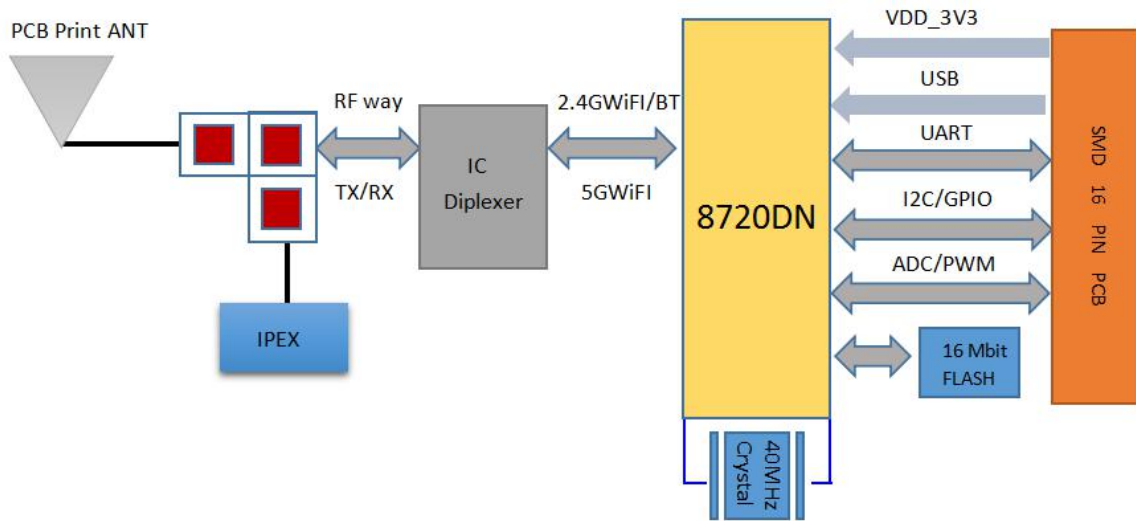
6.Electrical Specifications

1) DC Characteristics

Current Consumption	Min.	Typ.	Max.	Unit
DC 3.3V (with internal regulator and integrated CMOS PA)	-	-	450	mA
DC_IO (including VDD_IO)	-	-	200	mA
DC_IO_33 (3.3V I/O Rating Current)	-	-	50	mA
ESD Protection (VESD)	-	-	2000	V

BW16 series modules are Electrostatic Sensitive Devices and require special precautions while handling.

ESD precautions:

The BW16 module are electrostatic sensitive devices (ESD) and require special ESD precautions typically applied to ESD sensitive components. Proper ESD handling and packaging procedures must be applied throughout the processing, handling, transportation and operation of any application that incorporates the BW16 module. Don't touch the module by hand or solder with non-anti-static soldering iron to avoid damage to the module.

2) RF Characteristics for IEEE802.11a

Items	Contents			
Specification	IEEE802.11a			
Mode	OFDM 54Mbps			
Channel frequency	5.180-5.825GHz			
Freq.Error(±15ppm)	±10 ppm			
RX (PER≤-65dBm@10%)	-76 dBm			
TX Characteristics	Min.	Typ.	Max.	Unit
Power Level (±2dBm)		14		dBm
EVM (≤-25 dB)		-30		dB

3) RF Characteristics for IEEE802.11b

Items	Contents			
Specification	IEEE802.11b			
Mode	CCK 11 Mbps			
Channel frequency	2412 ~ 2472 MHz			
Freq.Error(±15ppm)	±10 ppm			
RX (PER≤-76dBm@8%)	-88 dBm			
TX Characteristics	Min.	Typ.	Max.	Unit
Power Level (±2 dBm)		16		dBm
EVM (≤-9 dB)		-21		dB

4) RF Characteristics for IEEE802.11g

Items	Contents
Specification	IEEE802.11g
Mode	OFDM 54Mbps
Channel frequency	2412 ~ 2484 MHz

Freq.Error(±15ppm)	±10 ppm			
RX (PER≤-65dBm@10%)	-78 dBm			
TX Characteristics	Min.	Typ.	Max.	Unit
Power Level (±2dBm)		16		dBm
EVM (≤-25)		-34		dB

5) RF Characteristics for IEEE802.11n　(BW20_MCS7)

Items	Contents			
Specification	IEEE802.11n BW20_MCS7			
Mode	BW20_MCS7 65 Mbps			
Channel frequency	2412 ~ 2472 MHz			
Freq.Error(±15ppm)	±10 ppm			
RX (PER≤-64dBm@10%)	-76 dBm			
TX Characteristics	Min.	Typ.	Max.	Unit
Power Level (±2dBm)		15		dBm
EVM (≤-28)		-31		dB

6) RF Characteristics for IEEE802.11n　(BW40_MCS7)

Items	Contents			
Specification	IEEE802.11n BW40_MCS7			
Mode	BW40_MCS7 65 Mbps			
Channel frequency	2412 ~ 2472 MHz			
Freq.Error(±15ppm)	±10 ppm			
RX (PER≤-61dBm@10%)	-74 dBm			
TX Characteristics	Min.	Typ.	Max.	Unit
Power Level (±2dBm)		15		dBm
EVM (≤-28)		-31		dB

7) RF Characteristics for IEEE802.11n （BW20_MCS7）

Items	Contents
Specification	IEEE802.11n BW20_MCS7

Mode	BW20_MCS7 65Mbps			
Channel frequency	5.180-5.825GHz			
Freq.Error(±15ppm)	±10ppm			
RX(PER≤61dBm@10%)	-75dBm			
TX Characteristics	Min.	Typ.	Max.	Unit.
Power Level(±2dBm)		13		dBm
EVM(≤28)		-31		dB

8) RF Characteristics for IEEE802.11n　(BW40_MCS7)

Items	Contents			
Specification	IEEE802.11n BW40_MCS7			
Mode	BW40_MCS7 65 Mbps			
Channel frequency	5.180-5.825GHz			
Freq.Error(±15ppm)	±10 ppm			
RX (PER≤-61dBm@10%)	-74 dBm			
TX Characteristics	Min.	Typ.	Max.	Unit
Power Level (±2dBm)		13		dBm
EVM (≤-28)		-30		dB

7.Package Dimensions & Pin Definition
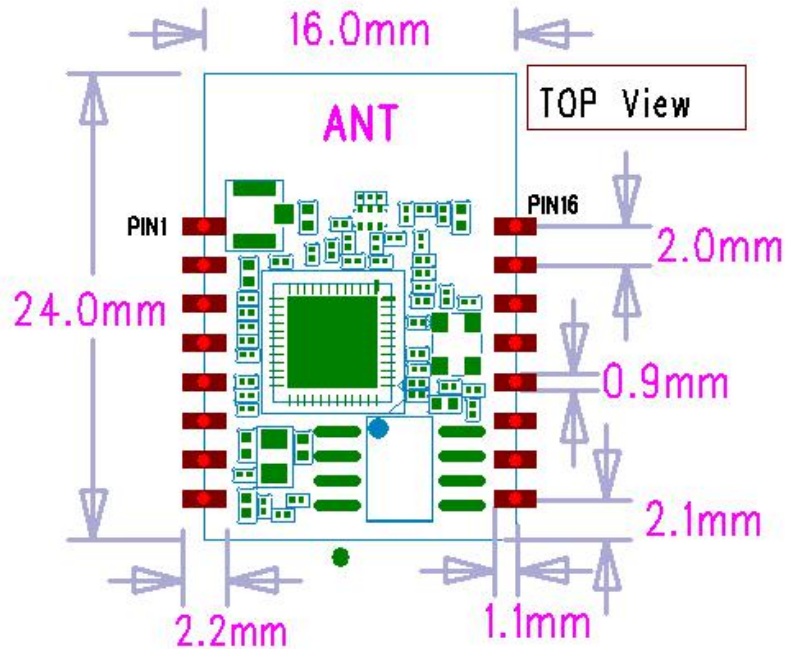
Pin No.	Definition	I/O	Description
1	PA[13]	IO	LP_PWM1、SPI1_MISO
2	PB[3]	IO	ADC、SWD_CLK
3	CHIP_EN	I	Enable chip. 1: Enable chip; 0: Shutdown chip
4	PA[15]	IO	SPI1_CS
5	PA[8]	IO	UART_LOG_RXD
6	PA[27]	IO	SWD_DATA
7	PA[26]	IO	LP_I2C_SDA、LP_PWM5
8	VDD_3V3	Power	3.3V INPUT、450mA MAX
9	GND	GND	GND
10	PA[25]	IO	LP_I2C_SCL、LP_PWM4
11	PA[7]	IO	UART_LOG_TXD
12	PA[14]	IO	SPI1_CLK
13	PA[30]	IO	LP_PWM1
14	PA[12]	IO	SPI1_MOSI、LP_PWM0
15	PB[2]	IO	LP_UART_RXD
16	PB[1]	IO	LP_UART_TXD

# 8. Reference Schematic of Evaluation Board

1) Power Supply Reference Design 350mA@3.3V and Ripple is less than 40mV
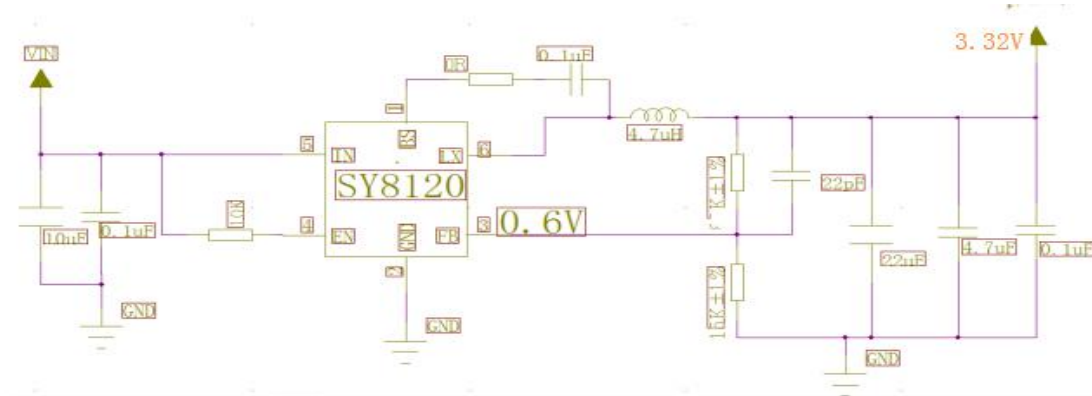
2)　This module have a print Antenna . In order to get the best RF performance of the end product, please pay attention to the rational design of the module and the placement of the antenna on the bottom plate according to this guide.

Option 1 (recommend):　Place the module along the edge of the main board, and keep the antenna out of main board pcb;

Option 2(recommend):　Place the module along the main board side, and keep enough space for anteana;
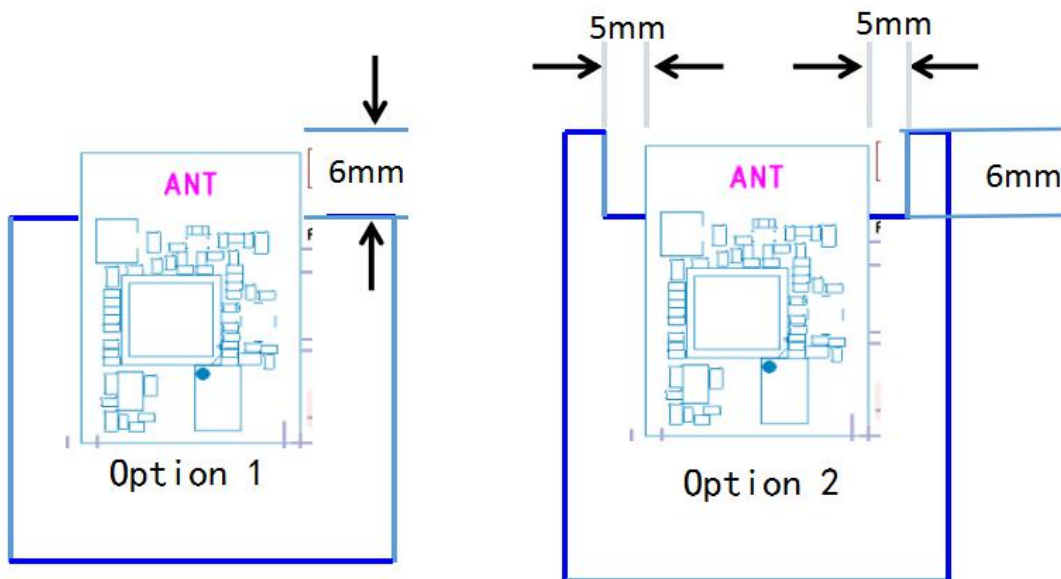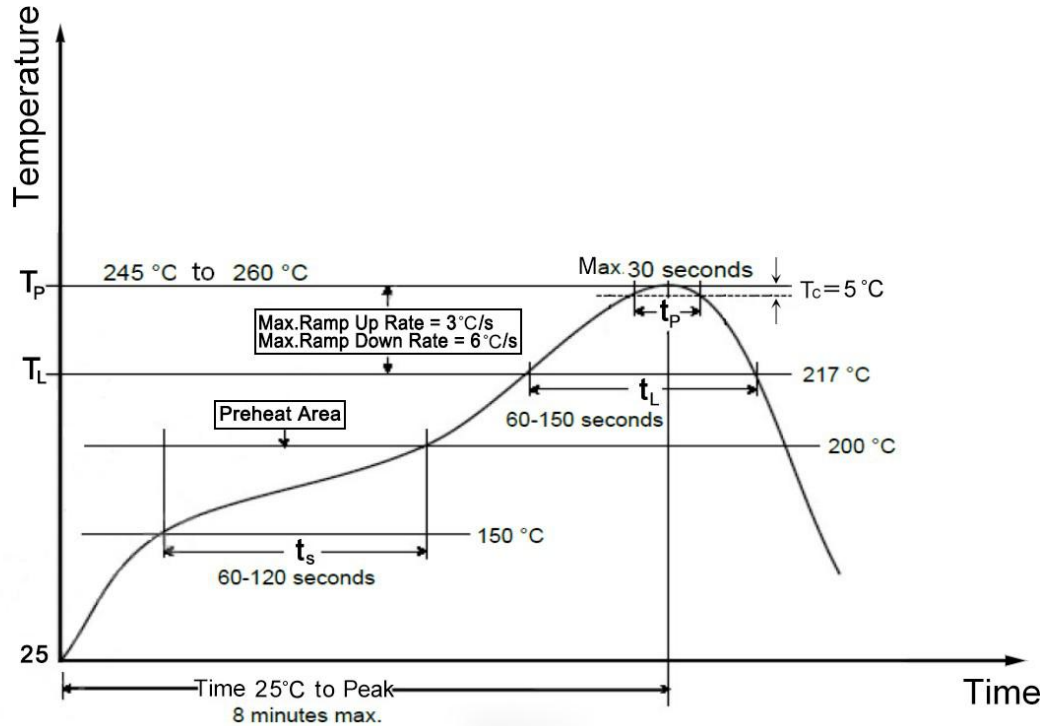
9. Manufacturing Process Recommendations

Figure 5: BW16 Typical Lead-free Soldering Profile

Note：The final soldering temperature chosen at the factory depends on additional external factors like choice of soldering paste，size，thickness and properties of the baseboard etc. Exceeding the maximum soldering temperature in the recommended soldering profile may permanently damage the module.

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

Radiation Exposure Statement: This equipment complies with FCC radiation exposure limits set forth for an uncontrolled rolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator and your body.
The final end product must be labeled in a visible area with the following:
"Contains Transmitter Module 2AHMR-BW16"
This radio module must not installed to co-locate and operating simultaneously with other radios in host system except in accordance with FCC multi-transmitter product procedures. Additional testing and equipment authorization may be required to operating simultaneously with other radio. The availability of some specific channels and/or operational frequency bands are country dependent and are firmware programmed at the factory to match the intended destination. The firmware setting is not accessible by the end user. 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. The final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed. The end user manual shall include all required regulatory information/warning as shown in this manual, including: This product must be installed and operated with a minimum distance of 20 cm between the radiator and user body.