

Project No: BW16

Date: 2019.06.13

Rev: V1.0

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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

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SPECIFICATION

Single-Chip low power dual bands Wireless LAN(WLAN) and Bluetooth Low Energy(v5.0) SoC Module

BW16

Version: V1.0



Change History of Revision

Revisio	Date	Contents of Revision Change	Compilation	Verify
V1.0	2019.06.13	Initial release	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	<ul style="list-style-type: none"> ● 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	<ul style="list-style-type: none"> ● 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	<ul style="list-style-type: none"> ● Support BLE5.0

Secure

Items	Description
Hardware engine	<ul style="list-style-type: none"> ● AES/DES/SHA hardware engine
TrustZone	<ul style="list-style-type: none"> ● TrustZone-M supported
Secure boot	<ul style="list-style-type: none"> ● Secure boot supported
SWD protection	<ul style="list-style-type: none"> ● Debug port access protection and prohibition modes
eFuse protection	<ul style="list-style-type: none"> ● Security eFuse
RSIP	<ul style="list-style-type: none"> ● 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
- 3 PWM interfaces
- All of the above interfaces can be used as GPIO

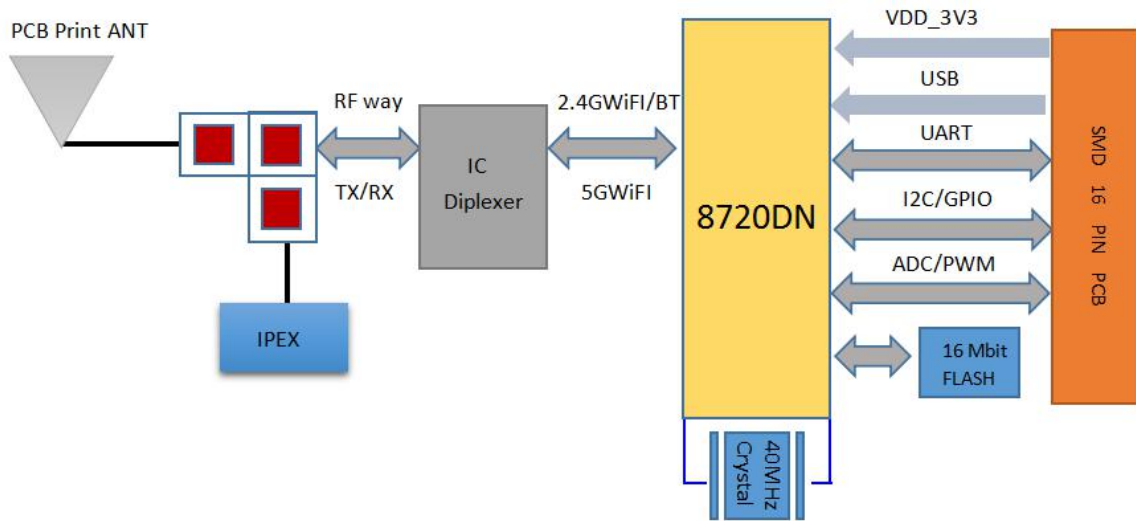
3. Applications

- 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(± 15 ppm)	± 10 ppm			
RX (PER ≤ -65 dBm@10%)	-76 dBm			
TX Characteristics	Min.	Typ.	Max.	Unit
Power Level (± 2 dBm)		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 ~ 2484 MHz			
Freq.Error(± 15 ppm)	± 10 ppm			
RX (PER ≤ -76 dBm@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(± 15 ppm)	± 10 ppm			
RX (PER ≤ -65 dBm@10%)	-78 dBm			
TX Characteristics	Min.	Typ.	Max.	Unit
Power Level (± 2 dBm)		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 ~ 2484 MHz			
Freq.Error(± 15 ppm)	± 10 ppm			
RX (PER ≤ -64 dBm@10%)	-76 dBm			
TX Characteristics	Min.	Typ.	Max.	Unit
Power Level (± 2 dBm)		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 ~ 2484 MHz			
Freq.Error(± 15 ppm)	± 10 ppm			
RX (PER ≤ -61 dBm@10%)	-74 dBm			
TX Characteristics	Min.	Typ.	Max.	Unit
Power Level (± 2 dBm)		15		dBm
EVM (≤ -28)		-31		dB

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

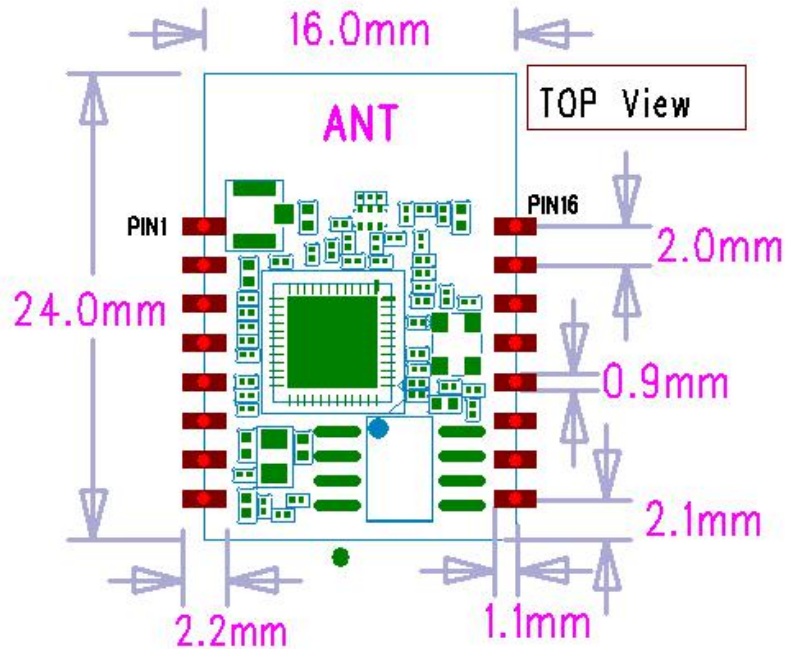
Items	Contents			
Specification	IEEE802.11n BW20_MCS7			

Mode	BW20_MCS7 65Mbps			
Channel frequency	5.180-5.825GHz			
Freq.Error(± 15 ppm)	± 10 ppm			
RX(PER ≤ 61 dBm@10%)	-75dBm			
TX Characteristics	Min.	Typ.	Max.	Unit.
Power Level(± 2 dBm)		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(± 15 ppm)	± 10 ppm			
RX (PER ≤ 61 dBm@10%)	-74 dBm			
TX Characteristics	Min.	Typ.	Max.	Unit
Power Level (± 2 dBm)		13		dBm
EVM (≤ 28)		-30		dB

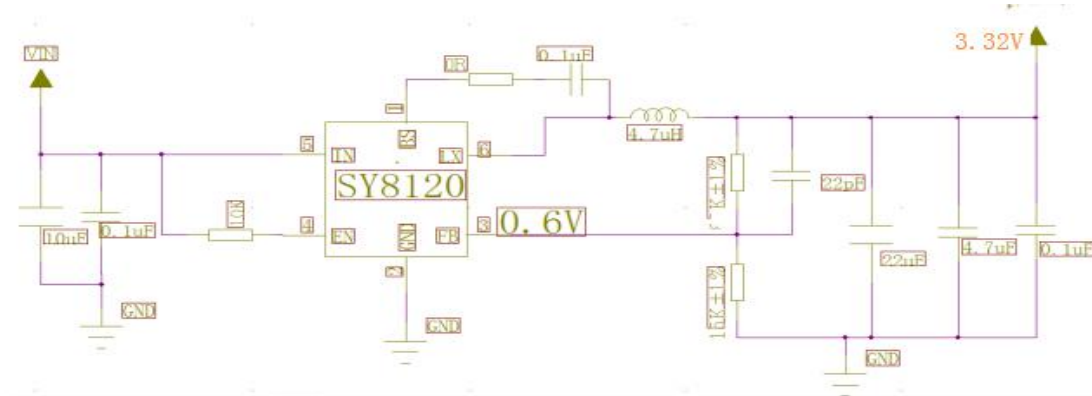
7.Package Dimensions & Pin Definition



Pin No.	Definition	I/O	Description
1	PA[13]	IO	LP_PWM1、SPI1_MISO
2	PB[3]	IO	ADC
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[28]	IO	LP_PWM0
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

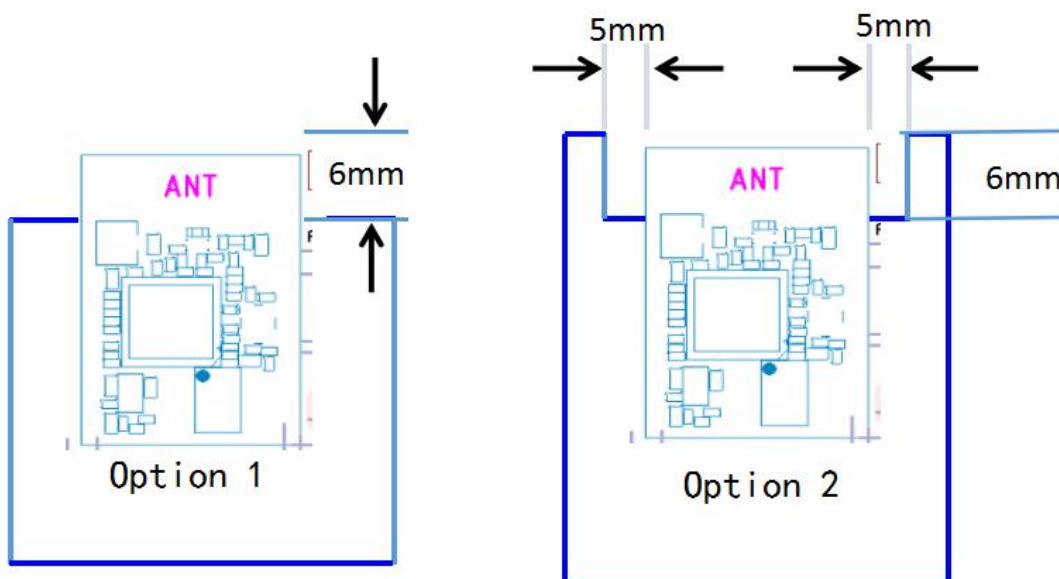
1) Power Supply Reference Design 350mA@3.3V and Ripple is less than 40mV



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 antena;



9. Manufacturing Process Recommendations

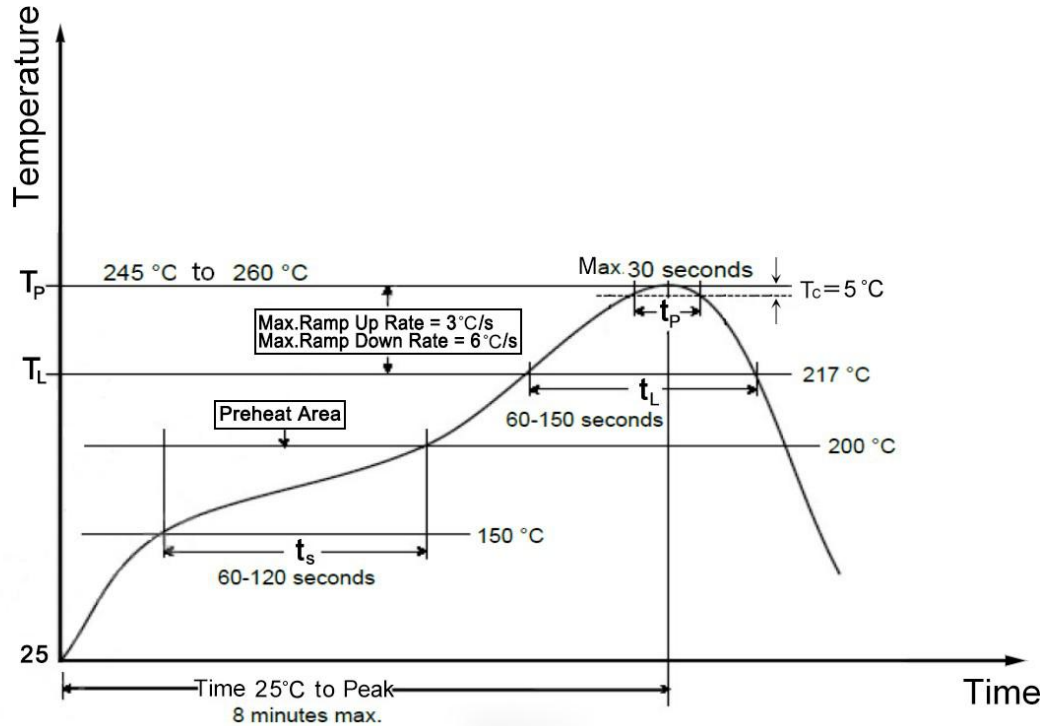


Figure 5: BW16 Typical Lead-free Soldering Profile

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.