

BW1360-PCIE

IEEE 802.11ac 3T3R Gigabit Wi-Fi Transceiver PCIe Module



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1 Device Overview

1.1 Features

BW1360 module is built around Broadcom BCM4360 single-chip Wi-Fi transceiver. It supports the 3-stream 802.11ac specification to enable data rate up to 1.3 Gb/s in high-quality video and media applications in homes and enterprises. The features supported include:

- 2.4 and 5 GHz dual-band operation
- 20, 40, or 80 MHz channel bandwidth
- Highest modulation scheme of 256-QAM
- 3 x 3 MIMO operation with PHY rate up to 1.3 Gb/s
- PCI Express 2.0 host interface
- 3 U.FL RF connectors
- 50.80 mm x 29.85 mm module size;
- Operation temperature: 0 °C ~ 55 °C

1.2 Applications

1.2.1 Typical Applications

This module is highly suitable for applications that demand for high throughput to make the most out of its 3 x 3 MIMO 802.11ac feature, such like consumer, surveillance, medical, and industrial video transmission.

The typical applications include the following:

- Routers
- Point of sale (POS)
- Set-up box
- Smart display
- Industrial automation
- Industrial gateway
- High resolution IP camera
- Medical device
- High resolution projector

1.2.2 Application Diagram

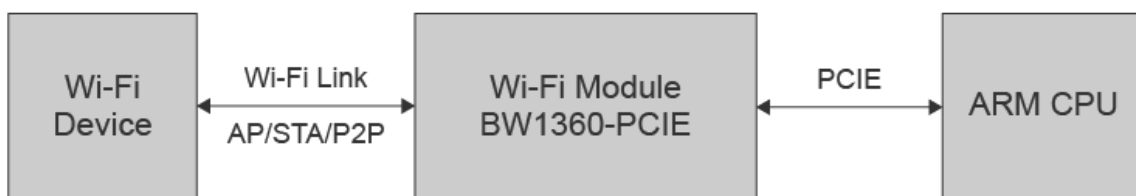


Figure 1. Application Diagram of BW1360-PCIE

1.3 Description

BCM1360 is a 2.4 and 5 GHz dual band 802.11ac 3 × 3 MIMO MAC/PHY/Radio WLAN controller. The device enables the development of PCIe™ 802.11ac WLAN client and router subsystems, which can benefit from the extremely high throughput and extended range of the Broadcom® MIMO technology.

With 11ac MIMO technology, WLAN data can be sent and received over two or more air streams simultaneously in the same frequency band. BCM1360 supports data rate up to 1.3 Gbps running 3 x 3 11ac MIMO at 5 GHz band. It also provides greater range and better coverage with beam forming.

State-of-the-art security is enabled by industry standard WPA and WPA2 (802.11i) and hardware AES encryption/decryption coupled with TKIP and IEEE 802.1X support. Embedded hardware acceleration benefits system performance and provides significant reduction in a host-CPU utilization in both client and access point configurations. BCM4360 also supports the widely accepted and deployed Broadcom WPS for ease-of-use wireless secured networks.

1.4 Functional Block Diagram

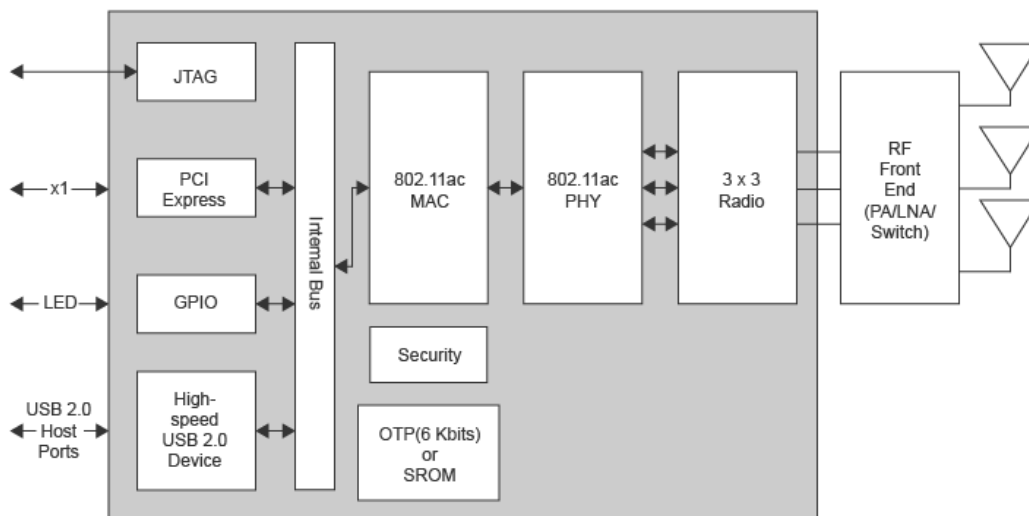


Figure 2. Functional Block Diagram of BW1360-PCIE

1.5 WLAN Specification

This module supports operation modes of Station and AP. It is typically used under AP mode in applications like industrial gateway, set-up box, etc. The supported operation system (OS) can be Linux or Android, depending on the host processor. The host processor and OS support needs to be confirmed and normally needs some custom support for driver porting and optimization.

Dimension	29.85 mm x 50.8 mm x 3.39 mm
Chip-set	BCM1360
Standard	IEEE802.11ac; IEEE802.11n; IEEE802.11g; IEEE802.11b; IEEE802.11a;
Modulation Type	OFDM (CCK/16-QAM/64-QAM/ 256 QAM)
Frequency Band	2.400 GHz ~ 2.500 GHz / 4.920 GHz ~ 5.805 GHz
Interface	Support PCI Express
Spread Spectrum	DSSS
Transmission Distance	Indoor up to 100 m, outdoor up to 300 m (depending on radio environment)
Data Security	64 bit /128 bit WEP, WPA/WPA2, WPA-PSK/WPA2-PSK (TKIP/AES)
Transmit Power	2.4 G [11g: 15±2 dBm, 11b: 17±2 dBm, 11n HT20: 14±2 dBm, 11n HT40: 14±2 dBm] 5G[11a: 12±2 dBm, 11n HT20: 12±2 dBm, 11n HT40: 12±2 dBm 11ac:HT80: 11±2 dBm]
Rx Sensitivity	1.3 Gbps: -57 dBm @ 10% PER 450 Mbps: -68 dBm @ 10% PER 54 Mbps: -72 dBm @ 10% PER 11 Mbps: -89 dBm @ 8% PER
Data Rate	802.11a/g [54, 48, 36, 24, 18, 12, 9 and 6 Mbps] 802.11b [11, 5.5, 2 and 1 Mbps] 802.11n: up to 450 Mbps 802.11ac: up to 1.3 Gbps
Operating Temperature	0 °C ~ 55 °C
Storage Temperature	-20 °C ~ 70 °C
Relative Humidity	10% ~ 95%
Antenna	External
Operation Voltage	3.3 V DC

3 Pin Configuration and Functions

3.1 Module Pin Diagram

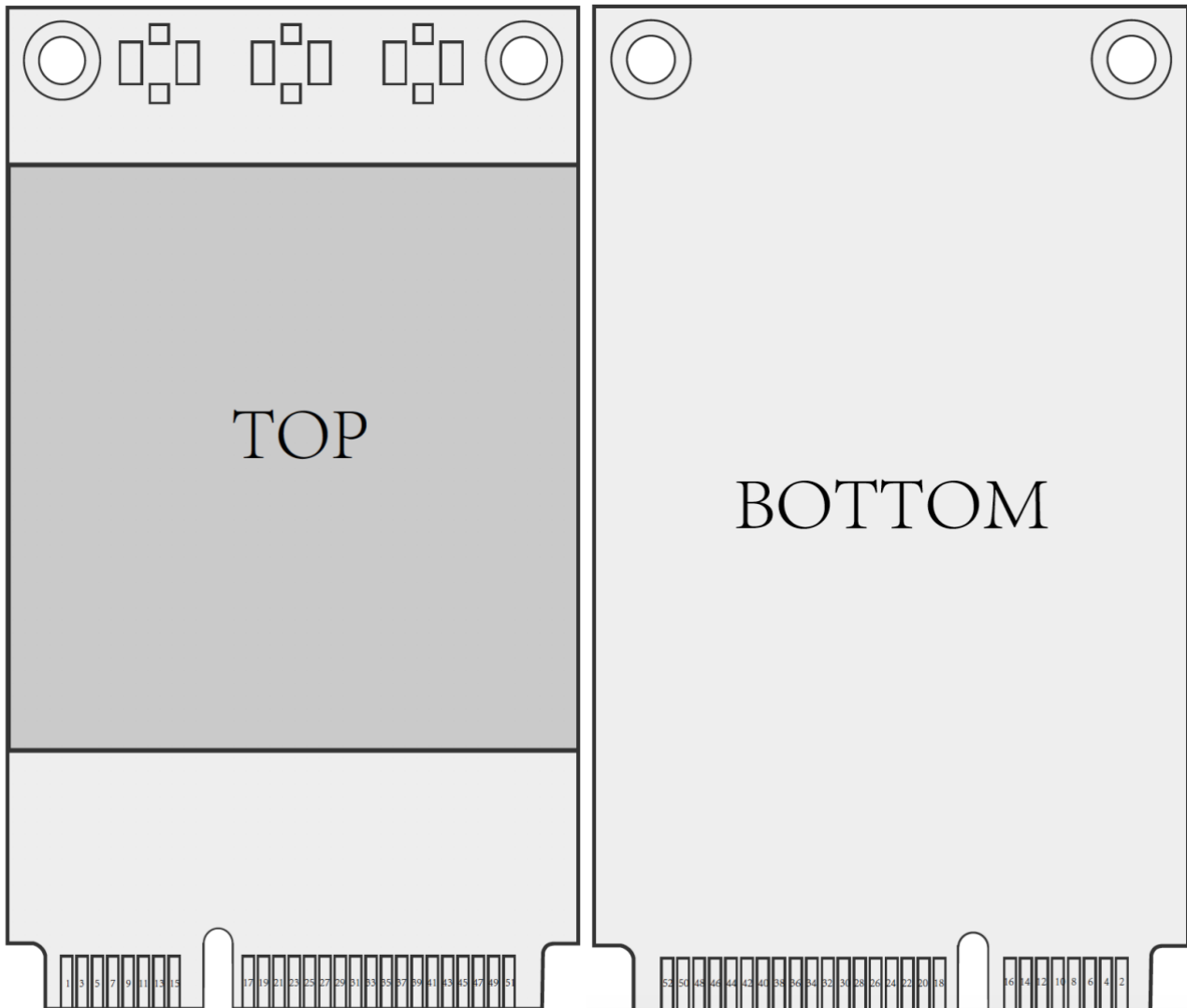


Figure 3. Pin Diagram of BW1360-PCIE

3.2 Pin Functions

Table1. Pin Attributes of BW1360-PCIE

Pin	Name	Description	Typical
1	WAKE_L	PCI Power management event output	INPUT/OUTPUT
2	VCC +3.3 V	+3.3 V Power supply	VCC_3.3 V
3	COEX1	NC	
4	GND	Ground	GND
5	COEX2	NC	
6	+1.5 V	NC	
7	CLKREQ_L	PCIe clock request signal	OUTPUT

8	UIM_PWR	NC	
9	GND	Ground	GND
10	UIM_DATA	NC	
11	REFCLK-	100 OHM differential pair clock signal negative	INPUT
12	UIM_CLK	NC	
13	REFCLK+	100 OHM differential pair clock signal positive	INPUT
14	UIM_RESET	NC	
15	GND	Ground	GND
16	UIM_VPP	NC	
17	UIM_C8	NC	
18	GND	Ground	GND
19	UIM_C4	NC	
20	W_DISABLE#	WLAN enable/disable	INPUT
21	GND	Ground	GND
22	RESET_L	PCI express fundamental reset	INPUT
23	PERn0	100 OHM differential pair TX data signal negative	OUTPUT
24	3.3 VAUX	+3.3 V Power supply	VCC_3.3 V
25	PERp0	100 OHM differential pair TX data signal positive	OUTPUT
26	GND	Ground	GND
27	GND	Ground	GND
28	1.5V	NC	
29	GND	Ground	GND
30	SMB_CLK	NC	
31	PETn0	100 OHM differential pair RX data signal negative	INPUT
32	SMB_DATA	No connected	
33	PETp0	100 OHM differential pair RX data signal positive	INPUT
34	GND	Ground	GND
35	GND	Ground	GND
36	USB_D-	NC	
37	GND	Ground	GND
38	USB_D+	NC	
39	VCC +3.3 V	+3.3 V Power supply	VCC_3.3 V
40	GND	Ground	GND
41	VCC +3.3 V	+3.3 V Power supply	VCC_3.3 V
42	LED_WWAN_L	NC	
43	GND	Ground	GND
44	LED_WLAN_L	WLAN Activity LED	OUTPUT
45	RSVD_45	NC	

46	LED_WPAN_L	NC	
47	RSVD_47	Connect to GPIO 5(pin 85 of BCM4360)	I/O
48	1.5 V	NC	
49	RSVD_49	NC	
50	GND	Ground	GND
51	RSVD_51	NC	
52	VCC +3.3 V	+3.3 V Power supply	VCC_3.3 V

4 Specifications

4.1 Absolute Maximum Rating

Caution! The absolute maximum ratings in the following table indicates voltages levels where permanent physical damage to the device can occur, even if these limits were exceeded for only a brief duration.

Parameter	Specification			Unit
	Min.	Typ.	Max.	
VBAT	-0.5	3	3.795	V
VDDIO	-0.5	3	3.795	V
MIC BIAS	-0.5	3	3.795	V
Storage Temperature	-20	25	70	°C
Operating Ambient Temperature	0	25	55	°C

4.2 RF Characteristics

Table 2. Typical Transmitting Power

Transmitting Mode	TX Power (dBm)	Variation (dB)
2.4 GHz 11b 11 Mbps	17	+/- 2
2.4 GHz 11g 54 Mbps	15	+/- 2
2.4 GHz 11n MCS7 HT20	14	+/- 2
2.4 GHz 11n MCS7 HT40	14	+/- 2
5 GHz 11a 54 Mbps	12	+/- 2
5 GHz 11n MCS7 HT20	12	+/- 2
5 GHz 11n MCS7 HT40	12	+/- 2
11ac MCS9 VHT80	11	+/- 2

Table 3. Typical Receiving Sensitivity

Receiving Mode	Sensitivity (dBm)
11ac MCS9 256-QAM VHT80 @1.3 Gbps	- 57
11n MCS23 64-QAM HT40 @450 Mbps	- 68
11n MCS16 BPSK HT20 @ 19.5 Mbps	TBD

4.3 Power Consumption Summary

Mode	I (mA)
Standby	9
TX, 2G, 20M, 11Mbps	337
TX, 2G, 20M, MCS0	308
TX, 2G, 20M, MCS16	649
TX, 5G, 40M, MCS0	439
TX, 5G, 40M, MCS16	877
TX, 5G, 80M, MCS9	502
TX, 5G, 80M, MCS9, NSS3	958
RX, 2G, 20M, MCS23	238
RX, 5G, 80M, MCS9, NSS3	458

5 Implementation

5.1 Layout Guideline

The three external antennas to connect need to be placed in the end product with the most spatial diversity allowed to avoid antenna coupling. In general, the larger distance and relative angle between adjacent antennas give better special diversity. As a rule of thumb, two adjacent antennas need to be separated in space of the half wavelength, roughly 3 cm in 5 GHz, and 6 cm in 2.4 GHz frequency band.

The differential PCIe data and clock lines need to be well controlled to be 100 Ohm impedance. VIAs need to be avoided with the best effort. If VIAs must be used in the differential lines, they need to be in pairs. Other general design cautions for high speed differential signal lines need to be followed as well.

6 Mechanical and Package

6.1 Mechanical Drawing

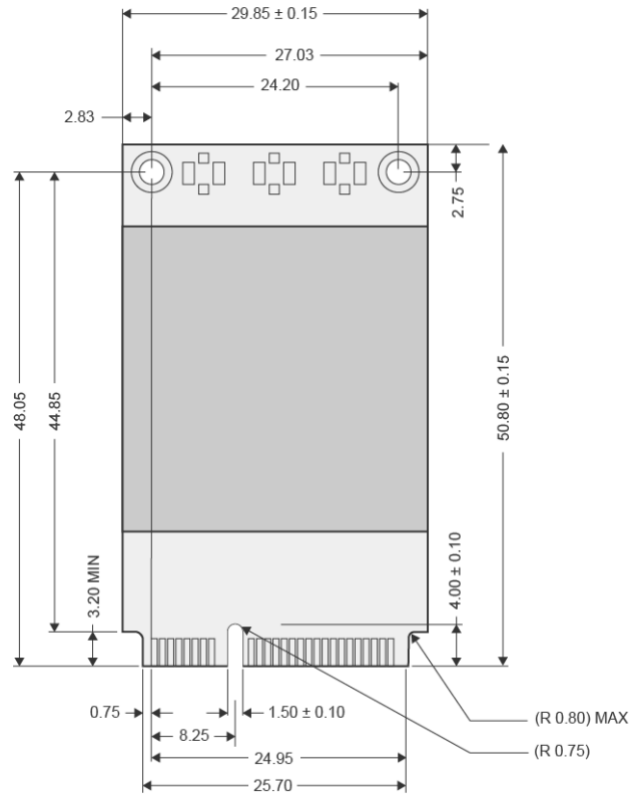


Figure 4. Recommended PCB Packaging of BW1360-PCIE

6.2 Packaging Information

The modules are packaged into blister trays, piled up, and tightened by rubber band before putting into carton boxes.

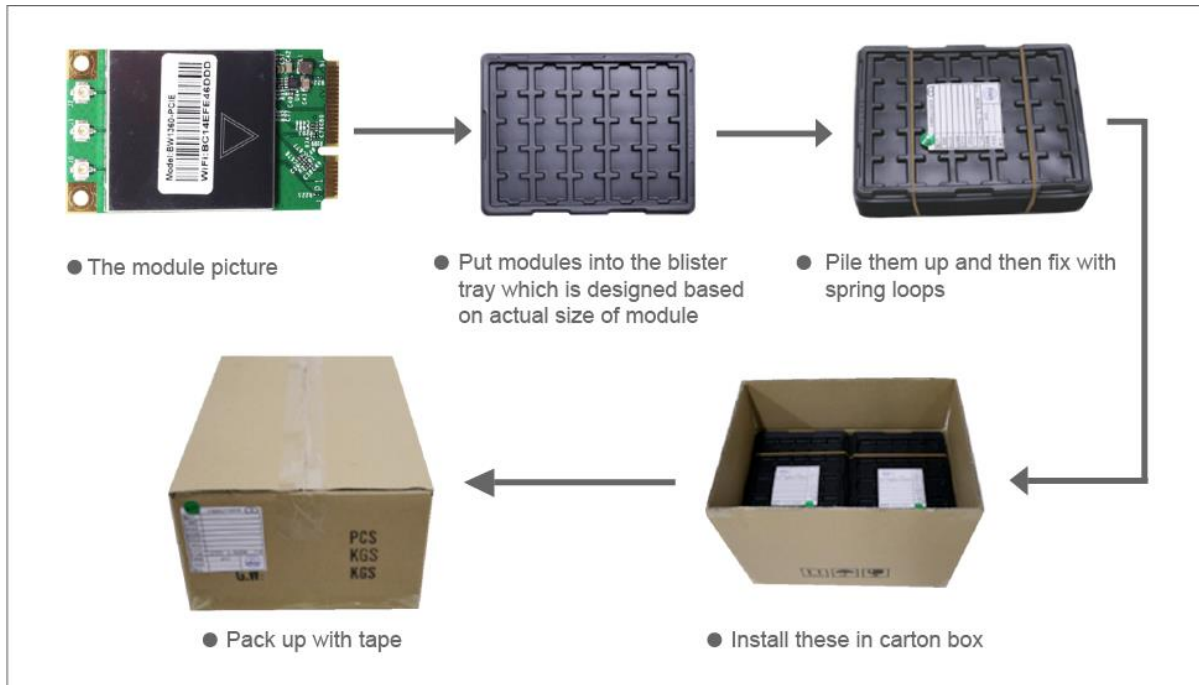


Figure 5. Packaging Information of BW1360-PCIE

7 Storage and Handling

The product shall be stored under the ambient temperature from 5 °C to 35 °C and the humidity from 20 to 60% RH. Packing materials may be deformed at the temperature over 40 °C.

The product shall be stored in corrosive gas (Cl₂, NH₃, SO₂, NO_x, etc.) free environment.

Any excess mechanical shock including, but not limited to, sticking the packing materials by sharp objects and dropping the product, shall be avoided.

ESD protection gloves or wristbands are recommended to wear when installing this module into the PCIe socket of a PCB board.

8 Revision History

Date	Version No.	Description	Author
2016.10.08	V 1.0	The draft version	Phil
2017.05.24	V 1.1	Modified the picture of module	Phil
2018.06.14	V 1.2	Remodified the picture of module	Phil
2019.09.18	V 1.3	Modified the PIN definition of module	Phil
2019.07.01	V 1.4	English version rewritten	