



Product Specification

DGF109A WLAN 802.11abgn/AC 2T2R with BT4.2 NGFF Card

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Release history:

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0.1	2017/01/02	Howard Juang	Initialized
0.2	2017/03/15	Clinton Wu	Add Module Photo
0.3	2017/06/13	Cynthia Lin	Add info
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0.4a	2017/06/22	Howard Juang	Update ordering information to add TFGA -11,-12,-13; Update open source driver information Update certifications
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0.5	2017/07/03	Howard Juang	Remove 2.3, 2.4
0.6	2018/01/18	Howard Juang	Update RF characteristics

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1 Product Description

Bointec DGF109A is a dual band 802.11ac/a/b/g/n Dual-Band WiFi + Bluetooth NGFF(M.2) adapter. It is a 2T2R (WiFi/BT co-existence supported) technology, with 20/40/80MHz and 256-QAM to maximize bandwidth. DGF109A lets you move at the speed of life with faster speeds (up to 867 Mbps, 1~3Mbps EDR for Bluetooth), higher capacity, broader coverage and longer battery life. Dramatically reshapes your connected experience.

Bointec DGF109A combines with Bluetooth 4.2 and provides a complete 2.4GHz Bluetooth system which is fully compliant to Bluetooth 4.1 and v2.1 that supports EDR of 2Mbps and 3Mbps for data and audio communications. It enables a high performance, cost effective, low power, compact solution that easily fits onto the PCI Express and USB M.2 module.

As base on Qualcomm Atheros WiFi technology advantage, the main chipset is using QCA6174A. Bointec DGF109A uses Direct Sequence Spread Spectrum (DSSS), Orthogonal Frequency Division Multiplexing (OFDM), BPSK, QPSK, CCK and QAM baseband modulation technologies. DGF109A incorporated with advanced security encryption, such as WEP, WPA, WPA2, and 802.1x for secure wireless connection

1.1 Features

Wi-Fi Features:

- Operates at ISM frequency Band(2.4/5GHz)
- IEEE Standards Support, 802.11a, 802.11b, 802.11g, 802.11n and 802.11ac
- Wi-Fi using Low power PCI Express interface
- Enterprise level security supporting: WPA, WPA2
- Two-stream spatial multiplexing up to 867Mbps data rate
- Supports 20/40MHz at 2.4GHz and supports 20/40/80MHz at 5GHz
- Additional features include maximal likelihood (ML) decoding, low-density parity check(LDPC), maximum ratio combining(MRC),Rx space time block code(STBC), MU-MIMO and transmit beam forming.

BT Features:

- Bluetooth V4.2, V4.1, V4.0 LE, V3.0+HS, Bluetooth V2.1+EDR system, backward compatible with BT version of 1.1, 1.2 and 2.0
- BT supports Class I (Output power up $\leq +10\text{ dBm}$)
- BT transmission speed including 1M, 2M and 3Mbps EDR operations

- Support for Simple Pairing (SP) and Enhanced Inquiry Response (EIR) function
- Support for SCATTERNET and PICONET
- HCI USB interface to work with Windows upper layer stack

Common Features:

- Form Factor: M.2(NGFF) 2230-S3-A-E (A Key, E Key)
- Support OS: Microsoft Windows/Linux/Android
- Support for BT & WLAN Co-existence
- RoHS Compliance
- Low Halogen Compliance

1.2 Product Configuration

Bointec DGF109A provides the following configurations:

Model	Frequency	Wi-Fi	Interface	Antenna
DGF109A	5GHz	802.11a 802.11ac	PCIe	MHF4 antenna connector X2
DGF109A	2.4GHz	802.11bgn	PCIe	MHF4 antenna connector X2
DGF109A	2.4GHz	Bluetooth	USB	MHF4 antenna connector X1, AUX

Table 1-1: Product Configurations

1.3 Appearance

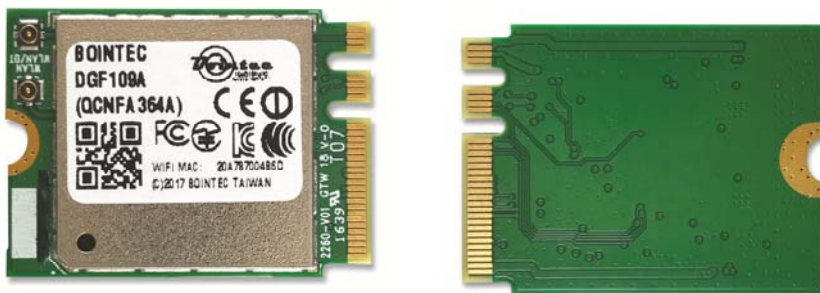


Figure1-1: DGF109A Appearance

2 Hardware

2.1 Block Diagram

DGF109A is hosted by Qualcomm Atheros QCA6174A-5 SoC. This SoC supports 2x2 MIMO (2Tx/2Rx) and operates in the 2.4GHz and 5GHz frequency band.

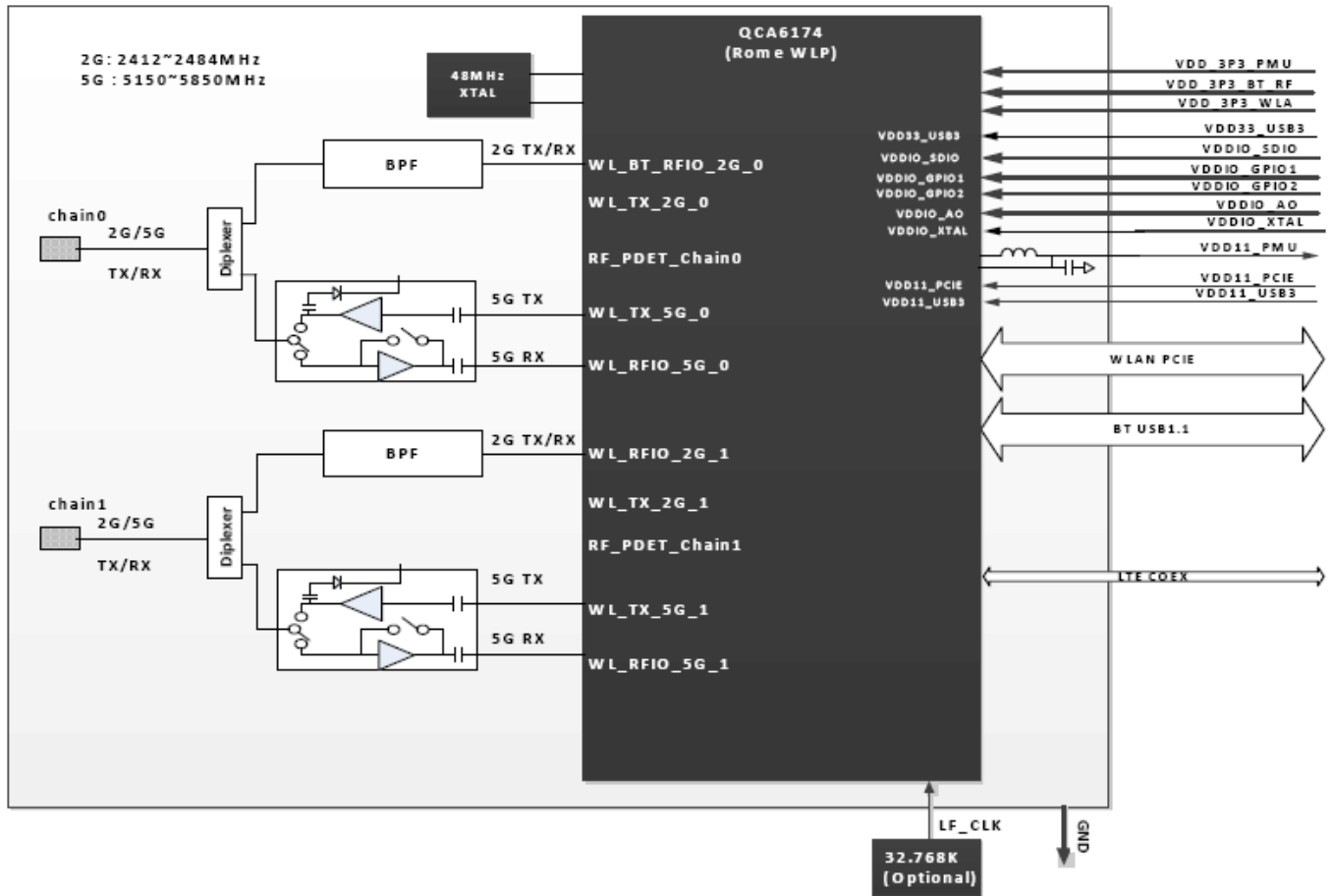


Figure 2-1 System Block Diagram of DGF109A

2.2 Pin Assignment

Bointec DGF109A pin definition as below:

Pin No.	Name	Direction	Description
1	GND	VSS/GND	Ground Pin
2	3.3V	VCC	3.3V power supply
3	USB_D_P	Input / Output	USB Differential signal
4	3.3V	VCC	3.3V power supply.
5	USB_D-	I/O	BT_USB_DN
6	LED_WLAN#	Output Open-Drain	Active low signal. The signal is used to provide status indicators via LED.
7	GND	GND	Ground.
8	NOTCH		
9	NOTCH		
10	NOTCH		
11	NOTCH		
12	NOTCH		
13	NOTCH		
14	NOTCH		
15	NOTCH		
16	LED_BT#	Output Open-Drain	Active low signal. The signal is used to provide status indicators via LED.
17	NC	Floating Pin, No connect to anything.	Floating
18	GND	GND	Ground.
19	NC	Floating Pin, No connect to anything.	Floating
20	NC	Floating Pin, No connect to anything.	Floating
21	NC	Floating Pin, No connect to anything.	Floating
22	NC	Floating Pin, No connect to anything.	Floating
23	NC	Floating Pin, No connect to anything.	Floating
24	NOTCH		
25	NOTCH		
26	NOTCH		
27	NOTCH		
28	NOTCH		
29	NOTCH		



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Pin No.	Name	Direction	Description
30	NOTCH		
31	NOTCH		
32	NC	Floating Pin, No connect to anything.	Floating
33	GND	GND	Ground.
34	NC	Floating Pin, No connect to anything.	Floating
35	PERp0	Analog input signal	Differential receive.
36	NC	Floating Pin, No connect to anything.	Floating
37	PERn0	Analog input signal	Differential receive.
38	NC	Floating Pin, No connect to anything.	Floating
39	GND	GND	Ground.
40	NC	Floating Pin, No connect to anything.	Floating
41	PETp0	Analog input signal	Differential transmit.
42	NC	Floating Pin, No connect to anything.	Floating
43	PETn0	Analog input signal	Differential transmit.
44	COEX3 (LTE_ACTIVE)	Input signals with weak internal pull-down, to prevent signals from floating when left open	LTE coexistence signal. (This signal is optional and not required if using 2-wire interface for LTE coexistence.)
45	GND	GND	Ground.
46	COEX2 (LTE_PRI)	Digital output signal	LTE co- existence signal.
47	REFCLK+	Analog input signal	Differential reference clock.
48	COEX2 (LTE_SYNC)	Input signals with weak internal pull-down, to prevent signals from floating when left open	LTE co- existence signal.
49	REFCLK-	Analog input signal	Differential reference clock.
50	NC	Floating Pin, No connect to anything.	Floating
51	GND	GND	Ground.
52	PERST#	Input signals with weak internal pull-down, to prevent signals from floating when left open	PCI Express reset with weak pull-down.
53	CLKREQ#	Output Open-Drain	Reference clock Request an external pull-up resistor to VCC is required.
54	BT_DISABLE#	Input	BT disables control.
55	PEWAKE#	Output Open-Drain	Open Drain active Low signal. This signal is used to request that the system return from a sleep/suspended state to service a function initiated wake event.



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Pin No.	Name	Direction	Description
56	W_DISABLE#	Input	WLAN disable control.
57	GND	GND	Ground.
58	NC	Floating Pin, No connect to anything.	Floating
59	NC	Floating Pin, No connect to anything.	Floating
60	NC	Floating Pin, No connect to anything.	Floating
61	NC	Floating Pin, No connect to anything.	Floating
62	NC	Floating Pin, No connect to anything.	Floating
63	GND	GND	Ground.
64	NC	Floating Pin, No connect to anything.	Floating
65	NC	Floating Pin, No connect to anything.	Floating
66	NC	Floating Pin, No connect to anything.	Floating
67	NC	Floating Pin, No connect to anything.	Floating
68	NC	Floating Pin, No connect to anything.	Floating
69	GND	GND	Ground.
70	NC	Floating Pin, No connect to anything.	Floating
71	NC	Floating Pin, No connect to anything.	Floating
72	3.3V	VCC	3.3V power supply.
73	NC	Floating Pin, No connect to anything.	Floating
74	3.3V	VCC	3.3V power supply.
75	GND	GND	Ground.

3 Software

3.1 Supported platform and driver

Operating System	Host Platform	Chipset Driver/Open Source Driver	Description
Microsoft® Windows 2000	x86(CISC)	Driver provided by Atheros or WHQL ; Open Source not available	
Microsoft® Windows 7	x86(CISC)	Driver provided by Atheros or WHQL ; Open Source not available	
Microsoft® Windows 8	x86(CISC)	Driver provided by Atheros or WHQL ; Open Source not available	
Linux 2.4.xx	ARM Freescale i.MX6 MIPS II	Driver provided by Qualcomm SDK; Open Source available from https://github.com/kvalo/ath10k-firmware/tree/master/QCA6174 AP/STA Mode	ath10k-firmware are the latest firmware files for ath10k, a mac80211 driver for QCA988x, QCA6174, QCA99XX and similar. The official location to download ath10k images is from linux-firmware: https://git.kernel.org/cgit/linux/kernel/git/firmware/linux-firmware.git/ For more information check the wiki: http://wireless.kernel.org/en/users/Drivers/ath10k/firmware
Linux 2.6.xx	ARM Freescale i.MX6 MIPS II	Driver provided by Qualcomm SDK; Open Source available from https://github.com/kvalo/ath10k-firmware/tree/master/QCA6174 AP/STA Mode	(as above)
Linux 4.0	ARM Freescale i.MX6 MIPS II	Driver provided by Qualcomm SDK; Open Source available from https://github.com/kvalo/ath10k-firmware/tree/master/QCA6174 AP/STA Mode	(as above)

Note: It is possible to use newer ath10k driver on an older kernel with backports project

3.2 Driver support and porting

Bointec DGF109A driver can be released by authorization or Qualcomm Atheros Inc. directly support. Please consult your Bointec representative or distributor.

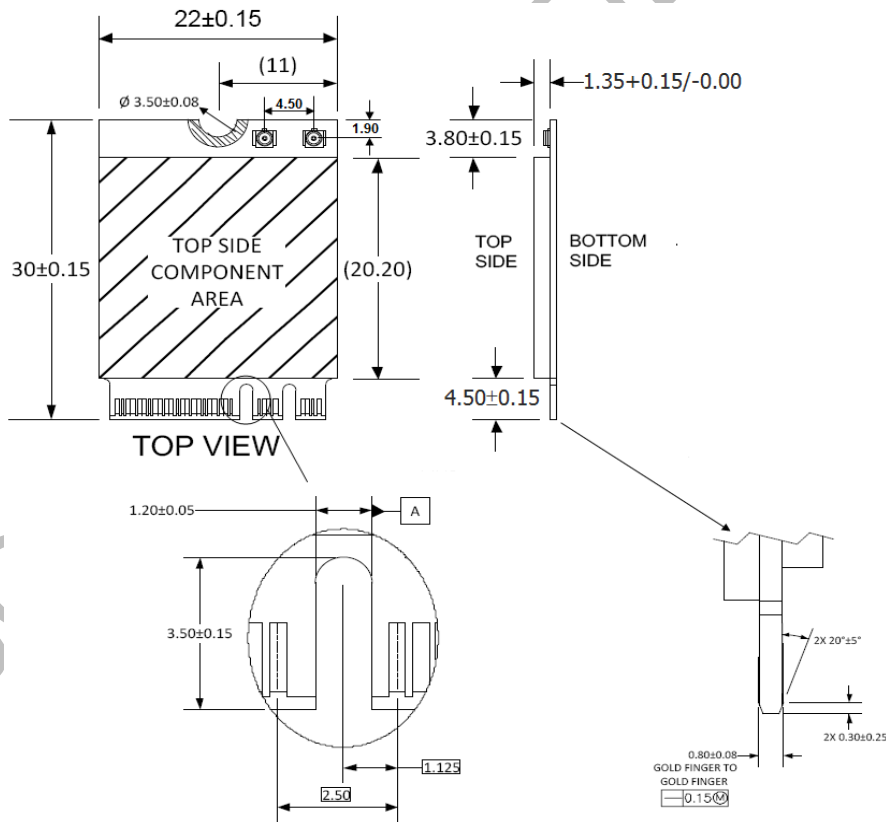
4 Mechanical

4.1 Appearance



Figure4-1: DGF109A Appearance

4.2 Dimension



Unit: mm

Figure 4-2. DGF109A Module

4.3 Antenna Dimension Drawing (mm)

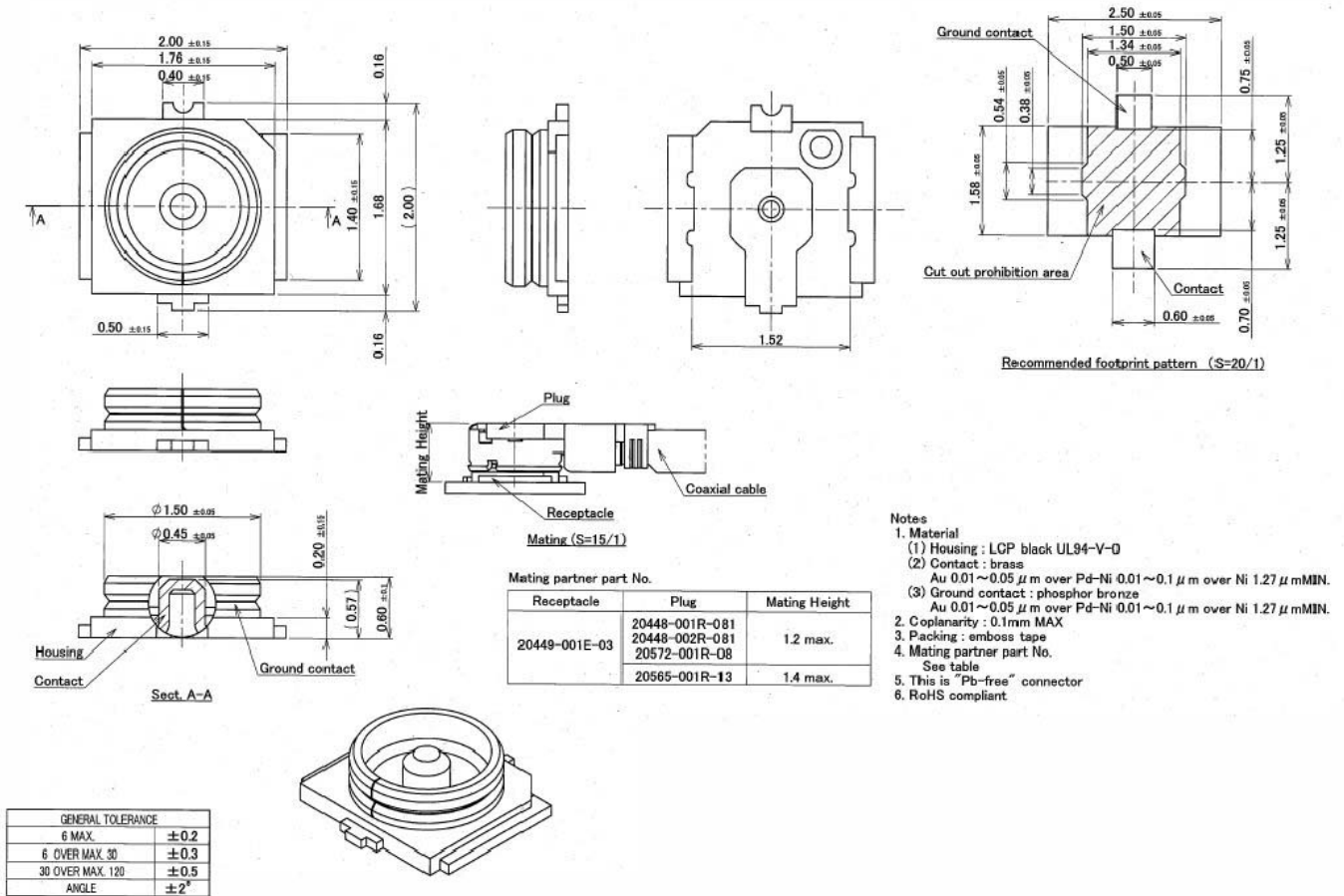


Figure 4-3. DGF109A Antenna Dimension

4.4 Packaging

100pcs modules in one Tray:



Figure 4-4-1. Tray Dimension(30x22.5x3 cm)

1000pcs modules in one box:



Figure 4-4-2. Box Dimension (32x24.5x31 cm)

5 Specification

5.1 General

WiFi	
Standard	IEEE802.11ac, IEEE802.11a, IEEE802.11b, IEEE 802.11g, IEEE 802.11n
Bus Interface	Low Power PCI Express
Data Rate	802.11a: 54, 48, 36, 24, 18, 12, 9, 6 Mbps 802.11b: 11, 5.5, 2, 1 Mbps 802.11g: 54, 48, 36, 24, 18, 12, 9, 6 Mbps 802.11n: MCS 0 to 15 for HT20MHz, MCS 0 to 15 for HT40MHz, 802.11ac: MCS 0 to 8 for HT20MHz MCS 0 to 9 for HT40MHz MCS 0 to 9 for HT80MHz
Media Access Control	CSMA/CA with ACK
Modulation Techniques	802.11ac: 256QAM, 64QAM, 16QAM, QPSK, BPSK 802.11a: 64QAM, 16QAM, QPSK, BPSK 802.11b: CCK, DQPSK, DBPSK 802.11g: 64QAM, 16QAM, QPSK, BPSK 802.11n: BPSK, QPSK, 16QAM, 64QAM
Network Architecture	Ad-hoc mode (Peer-to-Peer) Infrastructure mode
Security	WEP 64&128bit, WPA, WPA-PSK, WPA2, WPA2-PSK, WPS, IEEE 802.1X, IEEE 802.11i

Bluetooth	
Standard	Bluetooth V4.2, V4.1, V4.0LE, V3.0+HS, V2.1+EDR,
Bus Interface	USB1.1
Data Rate	1 Mbps, 2Mbps and Up to 3Mbps
Modulation Scheme	GFSK, $\pi/4$ -DQPSK and 8-DPSK
Frequency Range	2.402~2.480 GHz
Transmit Output Power	0 ≤ Output Power ≤ +10; Class 1 Device
Receiver Sensitivity	< 0.1% BER at -70dBm
Software	Bluetooth Suite

Electronics Characteristics	
Operating Voltage	3.3 V ±5% I/O supply voltage
OS Supported	Microsoft Windows/Linux/Android
Antenna Type	Dual MHF4 Antenna Connectors

5.2 RF characteristic

2.4GHz RF Specification

Feature	Description
WLAN Standard	IEEE 802.11a/b/g/n/ac WiFi compliant
Frequency Range	2.400 GHz ~ 2.484 GHz (2.4 GHz ISM Band)
Number of Channels	2.4GHz : Ch1 ~ Ch14
Modulation	802.11b : BPSK, QPSK, CCK 802.11 g/n : OFDM /64-QAM,16-QAM, QPSK, BPSK
Output Power	802.11b /11Mbps : 18 dBm±2dB @ EVM ≤ -9dB
	802.11g /54Mbps : 15 dBm±2dB @ EVM ≤ -25dB
	802.11n20 /MCS7 :14 dBm±2dB @ EVM ≤ -28dB
	802.11n40 /MCS7 :14 dBm±2dB @ EVM ≤ -28dB
Sensitivity (11b,20MHz) @8% PER	- 1Mbps PER @ -94 dBm, typical
	- 11Mbps PER @ -91 dBm, typical
Sensitivity (11g,20MHz) @10% PER	- 6Mbps PER @ -90 dBm, typical
	- 54Mbps PER @ -75 dBm, typical
Receive Sensitivity (11n,20MHz) @10% PER	- MCS=0 PER @ -90 dBm, typical
	- MCS=7 PER @ -71 dBm, typical
MIMO Receive Sensitivity (11n,20MHz) @10% PER	- MCS=8 PER @ -91dBm, typical
	- MCS=15 PER @ -72 dBm, typical
Receive Sensitivity (11n,40MHz) @10% PER	- MCS=0 PER @ -86 dBm, typical
	- MCS=7 PER @ -69 dBm, typical
MIMO Receive Sensitivity (11n,40MHz) @10% PER	- MCS=8 PER @ -87 dBm, typical
	- MCS=15 PER @ -70 dBm, typical
Receive Sensitivity (VHT,20MHz) @10% PER	- MCS=0 PER @ -89 dBm, typical
	- MCS=8 PER @ -68 dBm, typical
MIMO Receive Sensitivity (VHT,20MHz) @10% PER	- MCS=10, NSS1 PER @ -90 dBm, typical
	- MCS=18, NSS1 PER @ -69 dBm, typical
Receive Sensitivity (VHT,40MHz) @10% PER	- MCS=0, NSS1 PER @ -86 dBm, typical
	- MCS=9, NSS1 PER @ -63 dBm, typical
MIMO Receive Sensitivity (VHT,40MHz) @10% PER	- MCS=10, NSS1 PER @ -87 dBm, typical
Maximum Input Level	802.11b : -10 dBm



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	802.11g/n : -20 dBm
Antenna Reference	Small antennas with 0~2 dBi peak gain

*Conditions : VDD=3.3V ; Temp:25°C

5GHz RF Specification

Feature	Description
WLAN Standard	IEEE 802.11a/n/ac 2x2, WiFi compliant
Frequency Range	4.900 GHz ~ 5.845 GHz (5.0 GHz ISM Band)
Number of Channels	5.0GHz : Please see the table below
Modulation	802.11a : OFDM /64-QAM,16-QAM, QPSK, BPSK 802.11n : OFDM /64-QAM,16-QAM, QPSK, BPSK 802.11ac : OFDM /256-QAM, 64-QAM, 16-QAM, QPSK, BPSK
Output Power	802.11a /54Mbps : 13 dBm±2dB @ EVM ≤ -25dB 802.11n20 /MCS7 : 12.5 dBm±2dB @ EVM ≤ -28dB 802.11n40 /MCS7 : 12.5 dBm±2dB @ EVM ≤ -28dB 802.11ac20 /MCS 8: 11.5 dBm±2dB @ EVM ≤ -30dB 802.11ac40 /MCS9 : 10 dBm±2dB @ EVM ≤ -32dB 802.11ac80 /MCS9 : 10 dBm±2dB @ EVM ≤ -32dB
Receive Sensitivity (11a,20MHz) @10% PER	- 6Mbps PER @ -90 dBm, typical - 54Mbps PER @ -78 dBm, typical
Receive Sensitivity (11n,20MHz) @10% PER	- MCS=0 PER @ -90 dBm, typical - MCS=7 PER @ -74 dBm, typical
MIMO Receive Sensitivity (11n,20MHz) @10% PER	- MCS=8 PER @ -91 dBm, typical - MCS=15 PER @ -75 dBm, typical
Receive Sensitivity (11n,40MHz) @10% PER	- MCS=0 PER @ -87 dBm, typical - MCS=7 PER @ -71 dBm, typical
MIMO Receive Sensitivity (11n,40MHz) @10% PER	- MCS=8 PER @ -88 dBm, typical - MCS=15 PER @ -72 dBm, typical
Receive Sensitivity (VHT,20MHz) @10% PER	- MCS=0, NSS1 PER @ -90 dBm, typical - MCS=8, NSS1 PER @ -70 dBm, typical
MIMO Receive Sensitivity (VHT,20MHz) @10% PER	- MCS=10, NSS1 PER @ -91 dBm, typical - MCS=18, NSS1 PER @ -71 dBm, typical
Receive Sensitivity (VHT,40MHz) @10% PER	- MCS=0, NSS1 PER @ -87 dBm, typical - MCS=9, NSS1 PER @ -65 dBm, typical
MIMO Receive Sensitivity	- MCS=10, NSS1 PER @ -88 dBm, typical



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(VHT,40MHz) @10% PER	- MCS=19, NSS2 PER @ -66 dBm, typical
Receive Sensitivity (VHT,80MHz) @10% PER	- MCS=0, NSS1 PER @ -84 dBm, typical
	- MCS=9, NSS1 PER @ -62 dBm, typical
MIMO Receive Sensitivity (VHT,80MHz) @10% PER	- MCS=10, NSS1 PER @ -85 dBm, typical
	- MCS=9, NSS1 PER @ -63 dBm, typical
Maximum Input Level	802.11a/n : -30 dBm
Antenna Reference	Small antennas with 0~2 dBi peak gain

*Conditions : VDD=3.3V ; Temp:25°C

5GHz(20MHz) Channel Table

Band (GHz)	Operating Channel	Channel center frequencies(MHz)
5.15GHz~5.25GHz	36	5180
	40	5200
	44	5220
	48	5240
5.25GHz~5.35GHz	52	5260
	56	5280
	60	5300
	64	5320
5.5GHz~5.7GHz	100	5500
	104	5520
	108	5540
	112	5560
	116	5580
	120	5600
	124	5620
	128	5640
	132	5660
	136	5680
5.725GHz~5.825GHz	140	5700
	149	5745
	153	5765
	157	5785
	161	5805



Bluetooth Specification

Feature		Description		
General Specification				
Bluetooth Standard		BT 4.2 + HS, BLE, ANT+		
Host Interface		USB 1.1		
Frequency Band		2402 MHz ~ 2480 MHz		
Number of Channels		79 channels		
Modulation		FHSS, GFSK, DPSK, DQPSK		
Characteristics	Condition	TYP	BT Spec.	UNIT
Modulation GFSK	dF1 avg	154	140~ 175	KHz
	dF2 max	167	>115	KHz
	dF2 avg/dF1 avg	1.14	>0.8	
Modulation EDR @8DPSK	RMS DEVM	0.12	<0.13	
	99% DEVM	100	>99	%
	Peak DEVM	21.5	<25	%
RF Specification				
		Min.	Typical.	Max.
Output Power (Class 1.5)			6 dBm	
Sensitivity @ BER=0.1% for GFSK (1Mbps)			-91 dBm	
Sensitivity @ BER=0.01% for $\pi/4$ -DQPSK (2Mbps)			-90 dBm	
Sensitivity @ BER=0.01% for 8DPSK (3Mbps)			-83 dBm	
Maximum Input Level	GFSK (1Mbps):-20dBm			
	$\pi/4$ -DQPSK (2Mbps) :-20dBm			
	8DPSK (3Mbps) :-20dBm			

NOTE: The Bluetooth Power could be adjusted by FW.

NOTE2: *Conditions : VDD=3.3V ; Temp:25°C



Bluetooth Specification2: Bluetooth Low Energy Specifications

Feature		Description		
General Specification				
Bluetooth Standard		Bluetooth 4.2		
Host Interface		USB1.1		
Antenna Reference		Small antennas with 0~2 dBi peak gain		
Frequency Band		2402 MHz ~ 2480 MHz		
Number of Channels		79 channels		
Modulation		1M GFSK		
RF Specification				
Output Avg Power		Typical	Spec	
2402		0	-2~+2	[dBm]
2441		0	-2~+2	[dBm]
2480		0	-2~+2	[dBm]
Carrier Freq. Offset and Drift	Min	Typical	Max	
Freq. Accuracy	-150	3.7	150	[kHz]
Freq. Offset	-150	2.2	150	[kHz]
Freq. Drift	-50	2	50	[kHz]
Drift Rate		2.2	±20kHz/50us	[kHz]
Modulation Char.	Min	Typical	Max	
F1avg	225	254.1	275	[kHz]
F1max		256.3		[kHz]
F2avg	185	244.6		[kHz]
F2max		238.9		[kHz]
F1/F2 Ratio	0.8	0.94		
Sensitivity	2402	2441	2480	
LE (PER=30.8%)		-91	<-89	[dBm]
Max. Input Level (PER = 30.8%)	>= -10dBm	0		[dBm]
PER report integrity (PER = 50~65.4%)	50% at -30Bm	50.66%	65.4% at -30Bm	

*Conditions : VDD=3.3V ; Temp:25°C.

*test equipment: Anisu MT8852B

5.3 Environmental

Environmental	
Operating Temperature	● -10° ~ +65°C
Storage Temperature	● -40° ~ +80°C
Operating Humidity	● 10%~95%, non-condensing

5.4 Certifications

EMI Certifications

Certificate	Status
Argentina	ID available
Australia	COMPLETED
Azerbaijan	COMPLETED
Bahrain	COMPLETED
Bolivia	COMPLETED
Brazil (NFA344)	COMPLETED
Brazil (NFA345)	COMPLETED
Cambodia	COMPLETED
Canada (IC)	COMPLETED
Chile	COMPLETED
China	COMPLETED
Costa Rica	COMPLETED
Croatia	Covered under R&TTE;COMPLETED
Ecuador	COMPLETED
Egypt	COMPLETED
EU (R&TTE)	R&TTE; COMPLETED
Honduras	COMPLETED
India	COMPLETED
Indonesia	COMPLETED
Israel	COMPLETED
Jamaica	COMPLETED
Japan	COMPLETED
Jordan	COMPLETED
Kenya	COMPLETED
Kuwait	COMPLETED
Lebanon	COMPLETED
Malaysia	COMPLETED
Mexico	COMPLETED
Morocco	COMPLETED



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Nepal	COMPLETED
New Zealand	COMPLETED
Oman	COMPLETED
Pakistan	COMPLETED
Papau New Guniea	COMPLETED
Paraguay	COMPLETED
Peru	COMPLETED
Philippines	COMPLETED
Qatar	COMPLETED
Russia	COMPLETED
Saudi Arabia	COMPLETED
Serbia	COMPLETED
Singapore	COMPLETED
South Africa	COMPLETED
South Korea	COMPLETED
Taiwan	COMPLETED
Thailand	COMPLETED
UAE	COMPLETED
United states of America	COMPLETED
Ukraine	COMPLETED
Uruguay	COMPLETED
Venezuela	COMPLETED
Vietnam	COMPLETED

*For any country EMI/EMC certifications, radio authorizations of each country and region, other than above, please consult your Bointec Sales Representative for detail information.

6 Ordering Information

6.1 Related part numbers

Main parts

Part Number	System Description	Marketing Description
T.DGF109A-DK	DGF109A-DK, Single packed, Bointec packed, development kit packed	DGF109A Development Kit for Evaluation
T.DGF109A	DGF109A, Single packed	DGF109A, 802.11abgn/AC+BT4.2 NGFF, 2T2R, M.2, 2230, QCA6174A-5
TFGA-DGF109A0-11	finished non packaing, Bointec, DGF109A	802.11abgn/AC+BT4.2 NGFF, 2T2R, M.2, 2230 (RH11)
TFGA-DGF109A0-12	finished non packaing, Bointec, DGF109A	802.11abgn/AC+BT4.2 NGFF, 2T2R, M.2, 2230 (A9)
TFGA-DGF109A0-13	finished non packaing, Bointec, DGF109A	802.11abgn/AC+BT4.2 NGFF, 2T2R, M.2, 2230 (LN)
TFGA-DGF109A0-14	finished non packaing, Bointec, DGF109A	802.11abgn/AC+BT4.2 NGFF, 2T2R, M.2, 2230 (MP)

Accessories

Part Number	System Description	Marketing Description
TWRB-103EQ22-131	RF Coaxial, A=IPEX F/F, B=SMA M/M, 50ohm, 13cm	A=IPEX F/F270degree, B=SMA M/M, 50ohm, 13cm, guage=1.37, with Core
TWRB-003EQ01-210	RF Coaxial, A=IPEX F/F, B=SMA M/M, 50ohm, 210mm	A=IPEX F/F270degree, B=SMA M/M, 50ohm, 21cm, guage=1.37
TWRB-103EQ21-261	RF Coaxial, A=IPEX F/F, B=SMA M/M, 50ohm, 26cm	A=IPEX F/F270degree, B=SMA M/M, 50ohm, 26cm, guage=1.37, with Core
TWRB-003EQ01-300	RF Coaxial, A=IPEX F/F, B=SMA M/M, 50ohm, 300mm	A=IPEX F/F270degree, B=SMA M/M, 50ohm, 30cm, guage=1.37
TWRN-9161201-102	Antenna, WIFI, 108mm, 2.4GHz+5GHz, 2.5/3.0dBi	Antenna F/F OMNI, WIFI, 108mm, 2.4GHz+5.8GHz
TWRN-9161202-101	Antenna, WIFI, 108mm, 2.4GHz+5GHz,	Antenna F/F



DGF109A 802.11abgn/AC 2T2R with BT4.2 NGFF Card Product Specification

	2.0/2.0dBi	OMNI,WIFI,108mm,2.4GHz+5.8GHz
TWRN-9161201-191	Antenna,WIFI,19cm,2.4GHz/5GHz, 2.5/5.2dbi	Omni antenna, 2.4/5.8GHz,19cm
TWRN-9113203-151	Antenna,WIFI,15cm,2.4GHz+5GHz, 2.6dbi+3.3dbi	PCB antenna, 2.4GHz+5GHz,PCB-IPEX,150mm, PCB size 40mm*60mm*0.5mm
TWRN-9113204-151	Antenna,WIFI,15cm,2.4GHz+5GHz, 0.9dbi+3.8dbi	PCB antenna, 2.4GHz+5GHz,PCB-IPEX,150mm, PCB size 25mm*7mm*0.5mm
TWRN-2461201-001	Antenna,WIFI,108mm,2.4GHz,2dBi	Antenna, A=F/F,B=OMNI,WIFI,108mm,2.4GHz
TMEA-47C9991-001	MISC,EXTENTION,SECC, miniPCle extender	MISC,EXTENTION, SECC, miniPCle extender

6.2 Recommended Antenna List

Antennas	Vendors	2.4GHz Gain	5GHz Gain	MIC No19	MIC No.19-3	MIC 19-3-2	FCC Subpart-C	FCC Subpart-E	ETSI EN300329	ETSI EN301893
TWRN-9161201-102	Bointec	+2.50dBi	+3.00dBi	V	V	V	V	V	V	V
TWRN-9161202-101	Bointec	+2.00dBi	+2.00dBi	V	V	V	V	V	V	V
TWRN-9161201-191 (Including cable loss)	Bointec	+2.48dBi	+5.18dBi							
TWRN-9113203-151 (Including cable loss)	Bointec	+2.6dBi	+3.3dBi							
TWRN-9113204-151 (Including cable loss)	Bointec	+0.9dBi	+3.8dBi							
TWRN-2461201-001	Bointec	+2.48dBi								

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