



Product Specifications

IEEE802.11a/b/g/n/ac/ax BT 2T2R 2.4G/5G Dual with Integrated Bluetooth V5.2

Project Name	RTL8852BE Combo Module
Main Model	WD_RTL8852BELGA_V10 (Wi-Fi:PCIE /BT:USB2.0)
Version number	V10
Major Chipset	Realtek RTL8852BE-CG
Customer's Part NO	
Customer	

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Contents

1. General Description	3
2. Features	4
3. Block Diagram	5
4. General Specification	5
5. DC Characteristics	6
6. Electrical Specifications	6
7. Bluetooth Specification	8
8. Pin Definition	10
9. The PCB tolerances within + / -0.3 or so	14
10. Recommended Reflow Profile	14
11. FCC warnings	15
12. PACKING INFORMATION	16



1. General Description

The Realtek RTL8852BE is a highly integrated single-chip that support 2-stream 802.11ax solutions with Multi-user MIMO (Multiple-Input, Multiple-Output) with Wireless LAN (WLAN) PCI Express network interface controller with integrated Bluetooth 5 USB interface controller. It combines a WLAN MAC, a 2T2R capable WLAN baseband, and RF in a single chip. The RTL8852BE provides a complete solution for a high-performance integrated wireless and Bluetooth device.

The RTL8852BE baseband implements Multi-user Multiple Input, Multiple Output (MU-MIMO) Orthogonal Frequency Division Multiplexing (OFDM) with two transmit and two receive paths (2T2R). Features include two spatial stream transmissions, short Guard Interval (GI), spatial spreading, and support for variant channel bandwidth. Moreover, RTL8852BE provides one spatial stream space-time block code (STBC), Transmit Beamforming (TxBF) and Low Density Parity Check (LDPC) to extend the range of transmission. At the receiver, extended range and good minimum sensitivity is achieved by having receiver diversity up to 2 antennas. As the recipient, the RTL8852BE also supports explicit sounding packet feedback that helps senders with beamforming capability.

For legacy compatibility, Direct Sequence Spread Spectrum (DSSS), Complementary Code Keying(CCK) and OFDM baseband processing are included to support all IEEE802.11b, 802.11g and 802.11a data rates. Differential phase shift keying modulation schemes, DBPSK and DQPSK with data scrambling capability are available, and CCK provides support for legacy data rates, with long or short preamble. The CCK processor can perform dual-receiver by providing diversity gain to extend range and improve the reception. The high speed FFT/IFFT paths, combined with BPSK, QPSK, 16QAM, 64QAM, 256QAM, and up to 1024QAM modulation of the individual subcarriers, and rate compatible coding rate of 1/2, 2/3, 3/4, and 5/6, provide up to 1201Mbps for IEEE 802.11ax MIMO OFDM.

For advanced 11ax spec, RTL8852BE can receive with OFDMA (OFDM Access) technology. The RU size can be supported from small unit, e.g., RU26, and RU52, 106, 242, 484, and finally up to RU996. The high-order modulation scheme, such as 1024-QAM, can also be handled very well. Meanwhile, diff number of total subcarrier in the HE-LTF. such as 1x, 2x and 4x is considered. More networking efficiency can be achieved by 1x, and better channel estimation performance provided by 4x.

The RTL8852BE builds in an enhanced signal detector, an adaptive frequency domain equalizer, and a soft-decision Viterbi decoder to alleviate severe multi-path effects and mutual interference in the reception of multiple streams. For better detection quality, receive diversity with Maximal-Ratio-Combine(MRC), applying up to two receive paths, and Maximum-Likelihood Detection (MLD) are implemented. Robust interference detection and suppression are provided to protect against Bluetooth,



cordless phone, and microwave oven interference.

Receive vector diversity for multi-stream application is implemented for efficient utilization of the MIMO channel. Efficient IO-imbalance. DC offset, phase noise, frequency offset, and timing offset compensations are provided for the radio frequency front-end.

The RTL8852BE supports fast receiver Automatic Gain Control(AGC) with synchronous and asynchronous control loops among antennas, antenna diversity functions, and adaptive transmit power control functions to obtain better performance in the analog portions of the transceiver.

The RTL8852BE MAC supports 802.11e for multimedia applications, 802.11i and WAPI(Wireless Authentication Privacy Infrastructure) for security, and 802.11n/802.11ac/802.11ax for enhanced MAC protocol efficiency. Using packet aggregation techniques such as A-MPDU with BA and A-MSDU, protocol efficiency is significantly improved. Power saving mechanisms such as Legacy Power Save, U-APSD, and MIMO power saving reduce the power wasted during idle time, and compensate for the extra power required to transmit MIMO OFDM. The RTL8852BE provides simple legacy, 20MHz/40MHz/80MHz co-existence mechanisms to ensure backward and network compatibility.

2. Features

● General Information

- Support IEEE802.11a/b/g/n/ac/ax
- Complies with PCI Express base specification revision 2.1
- Dual-stream spatial multiplexing up to 1201Mbps data rate.
- Supports 20/40MHz at 2.4GHz and supports 20/40/80MHz at 5GHz
- Supports Transmit Beamforming

● Host Interface

- Supports PCIE interface for WLAN and UART/PCM interface for Bluetooth.

● Bluetooth Features

- Supports Bluetooth system (BT5.2 Logo Compliant)
- Supports WLAN/Bluetooth coexistence
- Compatible with Bluetooth v2.1+EDR.
- Dual Mode support: Simultaneous LE and BR/EDR
- BT host digital interface: USB

3. Block Diagram

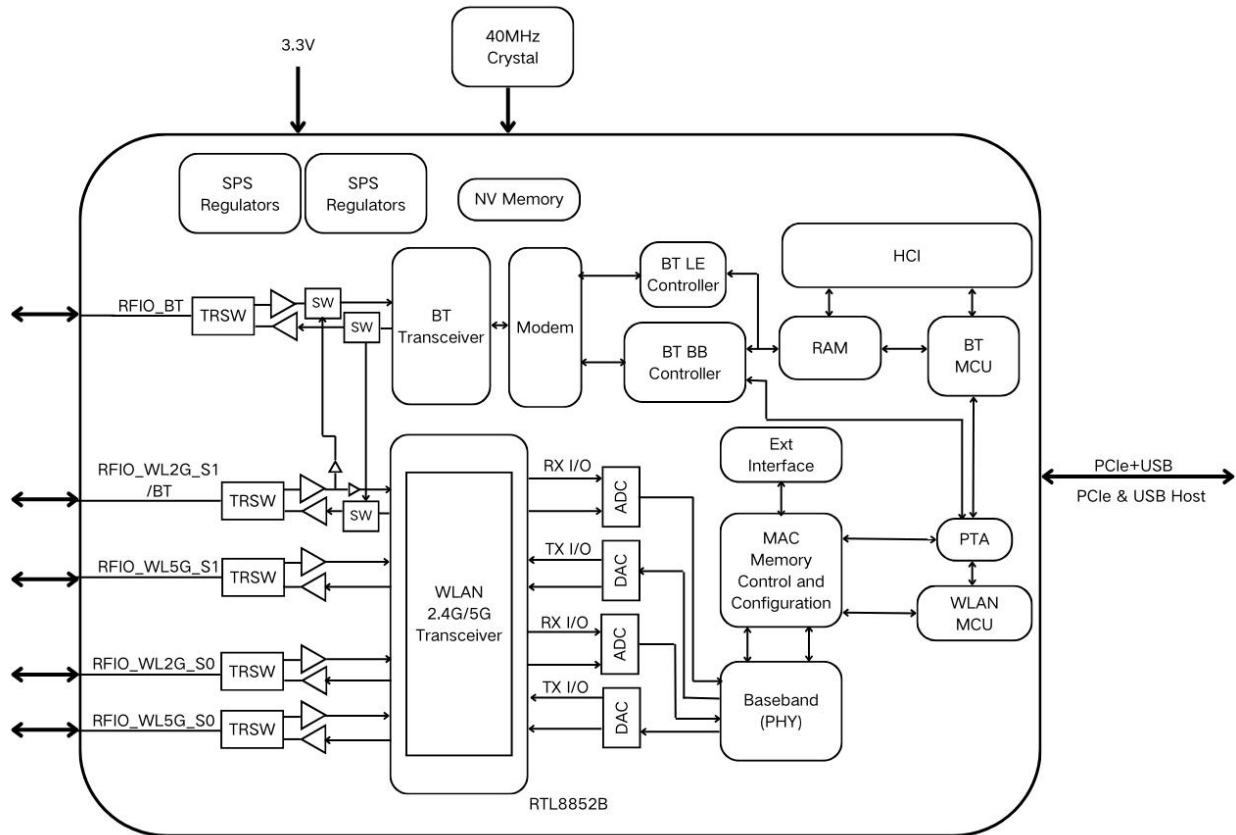


Figure 1. Dual-Band MIMO 2x2 Solution(11ax 2x2 MAC/BB/RF + PA) and Integrated Bluetooth Controller Solution --- RTL8852BE

4. General Specification

Product Name	WD_RTL8852BELGA_V10
Major Chipset	Realtek RTL8852BE-CG
Standard	WIFI: 802.11a/b/g/n/ac/ax BT : V5.2
Host Interface	WiFi: PCIE BT: USB2.0
Modulation Method	DSSS, DBPSK, DQPSK, CCK and OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM and 1024QAM)
Frequency Band	2400 ~ 2483.5MHz / 5150 MHz ~ 5850MHZ
OS Support	Linux/Android/Windows32,64
Security	WMM, WPA, WPA2,WPA3,WAPI



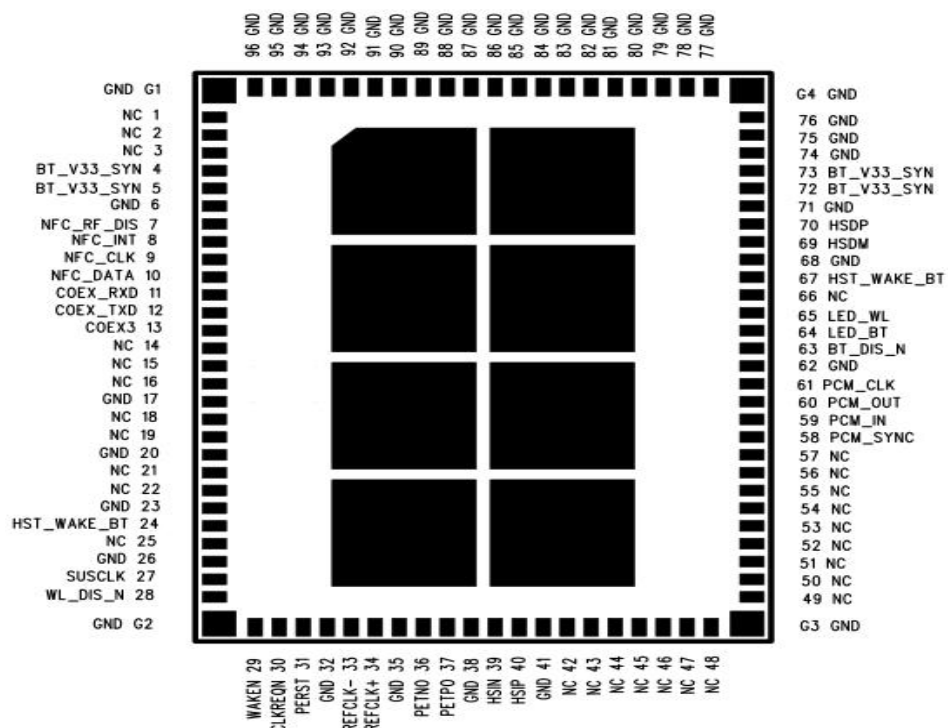
5. DC Characteristics

1) Power Supply Characteristics

Symbol	Parameter	Minimum	Typical	Maximum	Units
VDD33	3.3V I/O Supply Voltage	3.0	3.3	3.6	V
VD09	0.9V Core Supply Voltage	0.84	0.9	0.99	V
Peak Current		2A			



8. Pin Definition



Pin	Definition	Description
G1	GND	Ground
1	NC	NC
2	NC	NC
3	NC	NC
4	VDD33	3.3V
5	VDD33	3.3V
6	GND	Ground
7	NFC_RF_DIS	NC
8	NFC_INT	NC
9	NFC_CLK	NC
10	NFC_DATA	NC
11	COEX_RXD	GPIO6
12	COEX_TXD	GPIO12
13	COEX3	GPIO7



14	NC	NC
15	NC	NC
16	NC	NC
17	GND	Ground
18	NC	NC
19	NC	NC
20	GND	Ground
21	NC	NC
22	NC	NC
23	GND	Ground
24	HST_WAKE_DEV	GPIO13
25	NC	NC
26	GND	Ground
27	SUSCLK	Shared with EECS. External 32K or RTC clock input
28	WL_DIS_N	GPIO9
29	WAKE_N	WAKE_N
30	CLKREQ	CLKREQ
31	PERSTB	PCI Express Reset Signal: active low. When the PERST# is asserted at power-on state, the RTL8821CE returns to a pre-defined reset state and is ready for initialization and configuration after the de-assertion of the PERST#.
32	GND	Ground
33	REFCLK_N	PCI Express Differential Reference Clock Source: 100MHz±300ppm
34	REFCLK_P	PCI Express Differential Reference Clock Source: 100MHz±300ppm
35	GND	Ground
36	HS0N	PCI Express Transmit Differential Pair
37	HS0P	PCI Express Transmit Differential Pair
38	GND	Ground



39	HSIN	PCI Express Receive Differential Pair
40	HSIP	PCI Express Receive Differential Pair
41	GND	Ground
42	NC	NC
43	NC	NC
44	NC	NC
45	NC	NC
46	NC	NC
47	NC	NC
48	NC	NC
G3	GND	Ground
49	NC	NC
50	NC	NC
51	NC	NC
52	NC	NC
53	NC	NC
54	NC	NC
55	NC	NC
56	NC	NC
57	GND	Ground
58	PCM_SYNC	GPIO2
59	PCM_IN	GPIO0
60	PCM_OUT	GPIO1
61	PCM_CLK	GPIO3
62	GND	Ground
63	BT_DIS	GPIO11
64	BT_LED	LED1
65	WL_LED	LED2
66	NC	NC



67	HOST_WAKE_BT	GPIO13
68	GND	Ground
69	HSDM	High-Speed USB D- Signal
70	HSDP	High-Speed USB D+ Signal
71	GND	Ground
72	VDD33	3.3V
73	VDD33	3.3V
74	GND	Ground
75	GND	Ground
76	GND	Ground
G4	GND	Ground
77	GND	Ground
78	GND	Ground
79	GND	Ground
80	GND	Ground
81	GND	Ground
82	GND	Ground
83	GND	Ground
84	GND	Ground
85	GND	Ground
86	GND	Ground
87	GND	Ground
88	GND	Ground
89	GND	Ground
90	GND	Ground
91	GND	Ground
92	GND	Ground
93	GND	Ground
94	GND	Ground



95	GND	Ground
96	GND	Ground

9. The PCB tolerances within + / -0.3 or so

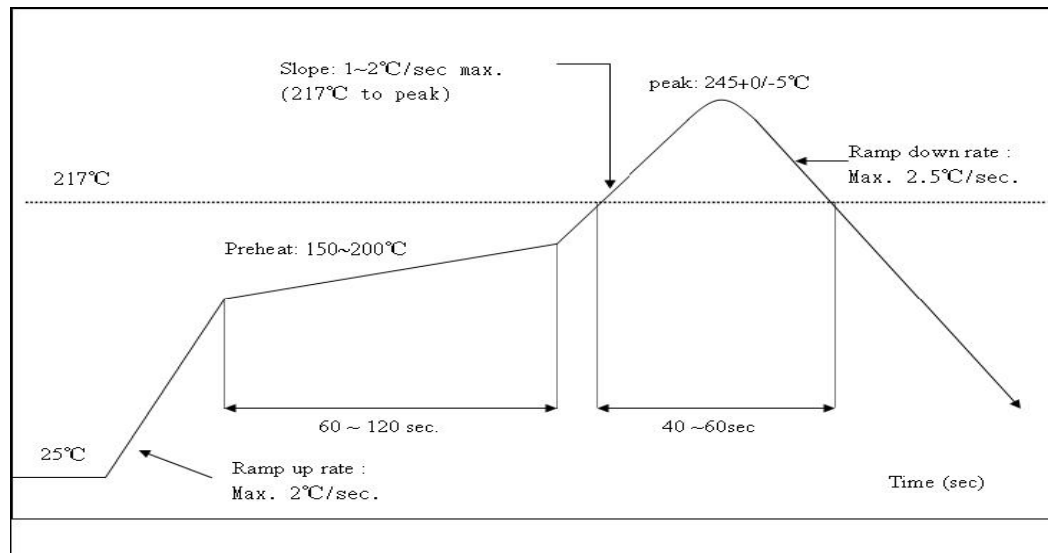
Dimensions (mm)	Length	Width	Height
	16.0	12.0	0.6
	(Tolerance:±0.3mm)	(Tolerance:±0.3mm)	(Tolerance:±0.3mm)

10. Recommended Reflow Profile

Referred to IPC/JEDEC standard.

Peak Temperature : <250°C

Number of Times : ≤2 times



ENVIRONMENTAL

Operating	Temperature: -10°C to +70°C
	Relative Humidity: 5-90% (non-condensing)
Storage	Temperature: -55°C to +125°C (non-operating)
	Relative Humidity: 5-95% (non-condensing)

Patch WIFI modules installed before the notice:

WIFI module installed note:

1. Please press 1 : 1 and then expand outward proportion to 0.7 mm, 0.12 mm thickness When open a stencil
2. Take and use the WIFI module, please insure the electrostatic protective measures.
3. Reflow soldering temperature should be according to the customer the main size of the products,



such as the temperature set at $250 \pm 5^\circ\text{C}$ for the MID motherboard.

About the module packaging, storage and use of matters needing attention are as follows:

1. The module of the reel and storage life of vacuum packing: 1). Shelf life: 8 months, storage environment conditions: temperature in: $< 40^\circ\text{C}$, relative humidity: $< 90\%$ r.h.

2. The module vacuum packing once opened, time limit of the assembly:

Card: 1) check the humidity display value should be less than 30% (in blue), such as: 30% ~ 40% (pink), or greater than 40% (red) the module have been moisture absorption.

2) factory environmental temperature humidity control: $\leq 30^\circ\text{C}$, $\leq 60\%$ r.h..

3) Once opened, the workshop the preservation of life for 168 hours.

3. Once opened, such as when not used up within 168 hours:

1) The module must be again to remove the module moisture absorption.

2) The baking temperature: 125°C , 8 hours.

3) After baking, put the right amount of desiccant to seal packages.

11. Federal Communication Commission Statement (FCC, U.S.)

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.

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

NOTE: 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 important announcement

Important Note:

Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator and your body.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. Country Code selection feature to be disabled for products marketed to the US/Canada.

This device is intended only for OEM integrators under the following conditions:

1. The antenna must be installed such that 20 cm is maintained between the antenna and users, and
2. The transmitter module may not be co-located with any other transmitter or antenna,
3. For all products market in US, OEM has to limit the operation channels in CH1 to CH11 for 2.4G band by supplied firmware programming tool. OEM shall not supply any tool or info to the end-user regarding to Regulatory Domain change. (if modular only test Channel 1-11)

As long as the three conditions above are met, further transmitter testing will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed.

**Important Note:**

In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

End Product Labeling

The final end product must be labeled in a visible area with the following"

Contains FCC ID: 2AXHE-RTL8852BELGA"

Manual Information to the End User

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module.

The end user manual shall include all required regulatory information/warning as show in this manual.

Integration instructions for host product manufactures according to KDB 996369 D03 OEM Manual v01**2.2 List of applicable FCC rules**

CFR 47 FCC PART 15 SUBPART C has been investigated. It is applicable to the modular transmitter

2.3 Specific operational use conditions

This module is stand-alone modular. If the end product will involve the Multiple simultaneously transmitting condition or different operational conditions for a stand-alone modular transmitter in a host, host manufacturer have to consult with module manufacturer for the installation method in end system.

2.4 Limited module procedures

Not applicable.

2.5 Trace antenna designs

Not applicable.

2.6 RF exposure considerations

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

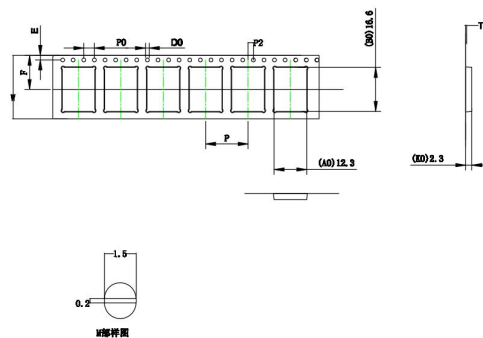


12. PACKING INFORMATION



Put the product into the load belt, one roll of load belt can put 1500PCS, one roll with an aluminum foil bag, into the humidity card, desiccant together packaging, 5 rolls for a box, a box of 7500PCS.

Humidity sensitivity class: MSL3



A0	B0	K0	P0	P	P2
12.3±0.1	16.6±0.1	2.3±0.1	4±0.1	16.0±0.1	2±0.1
W	T	E	F	DO	D1
24.0±0.3	0.3±0.05	1.75±0.1	11.5±0.1	1.5±0.1	0.0±0.1



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