seeed studio BM3301-1313 Wi-Fi 6 and BLE 5.4 Wireless Module User Manual

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Contents

Introduction

BM3301 – 1313 is a 2.4-GHz Wi-Fi6 and Bluetooth Low Energy wireless module based on TI's 10th generation connectivity combo chip CC3301, which is based upon proven technology. This Module is ideal for useincost-sensitive embedded application with a Linux or RTOS host running TCP/IP. This Module is an ideal platformfordeveloping wireless communication product solutions.

Features

- Wi-Fi 6
    - 2.4 GHz, 20 MHz, single spatial stream
    - MAC, baseband, and RF transceiver with support for IEEE 802.11 b/g/n/ax
    - Target wake time (TWT), OFDMA, MU-MIMO (Downlink), Basic Service Set Coloring, and trigger frame for improved efficiency
    - Hardware-based encryption and decryption using supporting WPA2 and WPA3
    - Excellent interoperability
    - Support for 4-bits SDIO or SPI host interfaces
- Bluetooth Low Energy 5.4
    - LE Coded PHYs (Long Range), LE 2M PHY (High Speed) and Advertising Extension
    - Host controller interface (HCI) transport with option for UART or shared SDIO
- Security
    - Secured host interface
    - Firmware authentication
    - Anti-rollback protection
- Application throughput up to 50 Mbps
- 3-wire or 1-wire PTA for external coexistence with additional 2.4-GHz radios (for example, Threader ZigBee)
- Multirole support (for example, concurrent STA and AP) to connect with Wi-Fi devices on different Channels (Wi-Fi networks)
- 1 integrated antenna port (supporting Wi-Fi and Bluetooth Low Energy coexistence)
- Compact footprint and pins with SMT package

- Integrated 2.4-GHz PA for complete wireless solution with up to +20dBm output power
- Using an IPEX Gen4 socket to connect an external antenna (ex: Rubber ducky antenna, PCB antenna, FP Cantina)
- **Operation temperature:** -40℃ to 85℃
- **Operation humidity:** 10%~ 85%

Application

- Internet of Things (IoT)
- Multimedia
- Home Electronics
- Home Application and White Goods
- Industrial and Home Automation
- Smart Gateway and Metering
- Video Conferencing
- Video Camera and Security

This product specification includes a detailed description of the BM3301 – 1x1x Module'sperformanceandfunctions. For the latest firmware, product updates or errata, please contact Seeed Studio.

Description

BM3301 – 1313 Module is embedded with TI CC3301, which is very suitable for the design of various embeddeddevices. The module, as seen in below diagram, comprise of:

- 40Mhz XTAL
- Bandpass filter
- Decoupling capacitors

Pin Diagram

Figure 2-3. BM3301-1313 Module Pin arrangement

Pin Attributes

Number	Name	Voltage Level	Type	Description
1	GND		–	Ground
2	NC		–	Not connected
3	IRQ_BLE	1.8V	–	IRQ_BLE to Host (in shared SDIO mode) (Reuseas working mode configuration)

Number	Name	Voltage Level	Type	Description
4	SWCLK	1.8	I	Serial Wire Debug CLK
5	SWDIO	1.8V	I/O	Serial Wire Debug DIN/DOUT
6	SDIO_CMD	1.8V	I/O	SDIO_CMD_WL (SPI_DIN)
7	GND		–	Ground
8	SDIO_CLK	1.8V	I	SDIO_CLK (SPI_CLK)
9	GND		–	Ground
10	SDIO_D0	1.8V	I/O	SDIO_D0_WL (SPI_DOUT)
11	SDIO_D1	1.8V	I/O	SDIO_D1_WL
12	SDIO_D2	1.8V	I/O	SDIO_D2_WL
13	SDIO_D3	1.8V	I/O	SDIO_D3_WL (SPI_CS)
14	IRQ_WL	1.8V	I/O	IRQ_WL to Host (Reuse as working mode configuration)
15	GND		–	Ground

16	GND		–	Ground
17	GND		–	Ground
18	ANT2/NC		–	Not connected
19	GND		–	Ground
20	GND		–	Ground
21	NC		–	Not connected
22	NC		–	Not connected
23	GND		–	Ground
24	GND		–	Ground
25	NC		–	Not connected
26	Fast_CLK_REQ	1.8V	O	Fast clock request from the device
27	ANT_SEL	1.8V	I/O	Default antenna select control line
28	GND		–	Ground
29	GND		–	Ground
30	GND		–	Ground
31	GND		–	Ground
32	ANT1_2.4GHz		ANT	WLAN and Bluetooth Low Energy RF Port
33	GND		–	Ground
34	GND		–	Ground
35	GND		–	Ground
36	Slow_CLK	1.8V	I	External Slow Clock Input
37	GND		–	Ground
38	VIO/1V8	1.8V	Power	1.8V Power Supply
39	GND		–	Ground

40	RESET	1.8V	I	Disable or enable the Module (Active low).
41	NC		–	Not connected
42	Logger	1.8V	O	UART TX Debug Logger (Reuse as working modec onfiguration
43	NC		–	Not connected
44	GND		–	Ground
45	GND		–	Ground
46	VBAT/3V3	3.3V	Power	3.3V Power Input
47	VBAT/3V3	3.3V	Power	3.3V Power Input
48	GND		–	Ground
49	GND		–	Ground
50	UART_RTS	1.8V	O	Device RTS signal – flow control for BLE HCI
51	UART_CTS	1.8V	I	Device CTS signal – flow control for BLE HCI
52	UART_TX	1.8V	O	UART TX for BLE HCI
53	UART_RX	1.8V	I	UART RX for BLE HCI
54	GND		–	Ground
55	GND		–	Ground
56	COEX_REQ	1.8V	I	External Coexistence Interface -Request
57	COEX_GRANT	1.8V	O	External Coexistence Interface -Grant
58	COEX_PRIORITY	1.8V	I	External Coexistence Interface -Priority
59	GND		–	Ground
60	NC		–	Not connected
61	GND		–	Ground
62	NC		–	Not connected
63	GND		–	Ground
64	GND		–	Ground
G1-G36	GND		–	Ground

Electrical characteristics

Absolute Maximum Ratings
Reaching or exceeding the maximum ratings listed in the table below can cause equipment damage.

Table 3-1. Absolute Maximum Ratings

Parameter	Description	min	max	unit
VBAT/3V3	1313-Module 3.3V Supply Voltage	-0.5	4.2	V

Normal working conditions

Table 3-2. Recommended Operating Conditions

Parameter	Description	min	TYP	max	unit
VBAT/3V3	1313-Module 3.3V Supply Voltage	3.01.62	3.31.8	3.61.98	VV
VIO/1V8	1313-Module 1.8V Supply & IO Voltage				
VIO Top	1313-Module IO voltage	1.62-40	1.8	1.98+85	V°C
	Operation temperature				

Electrical Characteristics

Table 3-3. BM3301-1x1x Module Electrical Characteristics

Parameter	Description	Test Condition	min	TYP	max	unit
VIH	High level input voltage		$0.65 \times V_{IO}$		VIO	V
VIL	Low level input voltage		0		$0.35 \times V_{IO}$	V
VOH	High level output voltage	At 4mA	VIO – 0.45		VIO	V
VOL	Low level output voltage	At 4mA	0		0.45	V

Module specifications

Table 3-4. BM3301-1313 Module features

ITEMs	Parameter		Specifications				Unit
Structure	Size	1313-Module	13.3(W) x 13.4(L) x 2(H)Max				mm
	Package	1313-Module	100 pins LGA Module				
	Sleep current	1313-Module	200 (TBD)				uA
			15(TBD)				
	Operation current (Transmitter)	1313-Module		Avg.	Peak	Conditions	mA
			3.3V	250	290	20.2dBm 6 OFDM	
				250		20dBm BLE 1M Channel 4	
			1.8V	105	170	20.2dBm 6 OFDM	
				105		20dBm BLE 1M Channel 4	
	Operation current (Receiver)		TBD @ Wi-Fi Continuous Receive				mA
			TBD @ Bluetooth Scan				
			TBD @ Wi-Fi Scan				
	TX Output power(Max)		20 @ 11ax SU ER MCS0				dBm
			16 @ BLE 20dBm 1M Channel 4				
	Sensitivity		Wi-Fi@20-MHz bandwidth. At <10% PER limit				dBm

ITEMs	Descriptions
Peripheral Interface	SDIO 3.0
	SPI
	UART
	Coexistence
	SWD

Timing and Switching Characteristics

Power Supply Sequencing

For proper operation of the device, perform the recommended power-up sequencing as follows:

1. All supplies (VBAT, VIO) must be available before Reset is released.
2. For an external slow clock, ensure that the clock is stable before Reset is disserted (high).
3. The Reset pin should be held low for 10 us after stabilization of the external power supplies.

Clocking Specifications

A slow clock running at 32.768 kHz for low power modes

Slow Clock Generated Internally

In order to minimize external components, the slow clock can be generated by an internal oscillator. However, this clock is less acurrate and consumes more power than sourcing the slowclock externally. For this scenario the Slow_CLK pin should be left not connected.

Slow Clock Using an External Oscillator

For optimal power consumption, the slow clock can be generated externally by an oscillator or sourcedfrom elsewhere in the system. The external source must meet the requirements listed below. Thisclock should be fed into the BMCC3301-1313 pin Slow_CLK and should be stable before nReset isdeasserted and device is enabled.

External Slow Clock Requirement

Parameter	Description	min	TYP	max	Unit
Input slow clock frequency	Square wave		32768		Hz
Frequency accuracy	Inital + temperature + aging			±250	ppm
Input Duty cycle		30	50	70	%
Rise and fall time	10% to 90% (rise) and 90% to 10%(fall) of digital signal level			100	ns
VIL (Input low level)		0		0.35 x VIO	V
VIH (Input high level)		0.65 x VIO		1.95	V
Input impedence		1			MΩ
Input capacitance				5	pF

Application information

Package information

BM3301-1313 Module Package information

Figure 5-1-1. BM3301-1313 Module Package Outline Drawing

Land Pattern

The following figure shows the recommended pad dimensions.

Module Recommended Pad Dimensions

Figure 5-2-1. BM3301-1313 Module Recommended Pad Dimensions

Reference design based on BM3301-1x1x Module

Considering different application scenarios, we provide two different reference designs.
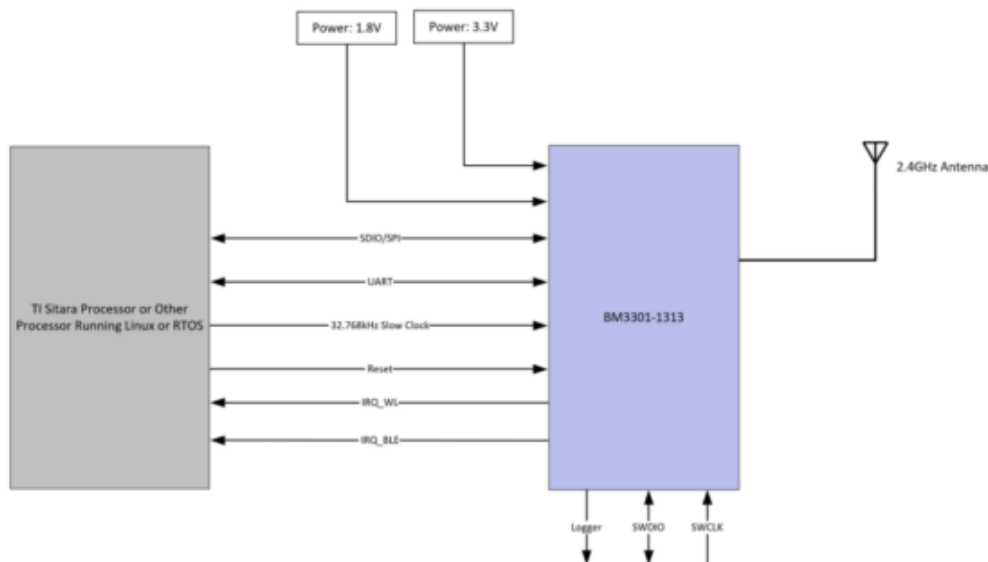
BM3301-1313 Module Block Diagram

Figure 5-3-1. BM3301-1313 Module System Block Diagram

Notes:

1. IRQ_WL, IRQ_BLE, Logger are used to configure the working mode. IRQ_WL, IRQ_BLE need to be pulled down, Logger needs tobe pulled up.
2. IRQ_WL, IRQ_BLE, Logger already have internal pull-up or pull-down resistors. External resistors are not required, but it is

   recommended to reserve positions for resistors.
3. SWDIO, do not add pull-down resistor.
4. SWCLK, do not add pull-up resistor.

SDIO lines
Due to the size of the module, the length of SDIO lines is not equal within the module, andit is necessary to compensate for the unequal length lines in your design.

The length of each SDIO lines of BM3301-1313 Module

- SDIO_CLK: 215.67 mil
- SDIO_CMD: 200.84 mil
- SDIO_D0: 119.37 mil
- SDIO_D1: 170.47 mil
- SDIO_D2: 214.72 mil
- SDIO_D3: 276.10 mil

Ordering information

Technical Support:
Sales:

Table 5 Ordering Information

Part Number	Package size (mm)	IPEX GEN4
BM3301-1313 Module	13(W) x 13(L) x 2.1(H)max	No

Reversion

V0.9 2023-05-25 Draft release

FCC

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.

Any Changes or modifications not expressly approved by the party responsible for compliance could voidtheuser'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, pursuantto 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 frequencyenergyand, if not installed and used in accordance with the instructions, may cause harmful interference toradiocommunications. 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 determinedbyturning the equipment off and on, the user is encouraged to try to correct the interference by one or moreof 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.

This modular complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. This modular must be installed and operated with a minimum distance of 20 cm between the radiator and user body.

If the FCC identification number is not visible when the module is installed inside another device, thentheoutside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following: "Contains Transmitter Module FCC ID:Z4T-BM3301-1313"

The module is limited to OEM installation ONLY

The OEM integrators is responsible for ensuring that the end-user hasno manual instructions to removeor install module

The module is limited to installation in mobile or fixed applications,according to Part 2.1091(b)

The separate approval is required for all other operatingconfigurations, including portable configurations withrespect to configurations

The devices must be installed and used in strict accordance with the manufacturer's instructions as describedinthe user documentation that comes with the product.

Antenna Type	Antenna Gain
Rod antenna	2.81 dBi
PCB antenna	2.87 dBi

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Documents / Resources

BM3301 – 1313 Module Wi-Fi 6 and BLE 5.4 Wireless Module, Powered by T115Q6Q Datasheet Datasheet V0.8	**seeed studio BM3301-1313 Wi-Fi 6 and BLE 5.4 Wireless Module** [pdf] User Manual Z4T-BM3301-1313, Z4TBM33011313, BM3301-1313 Wi-Fi 6 and BLE 5.4 Wireless Module, BM3301-1313, Wi-Fi 6 and BLE 5.4 Wireless Module, BLE 5.4 Wireless Module, Wireless Module, Module

References

- 🌐 **Seeed Studio Bazaar, The IoT Hardware enabler.**
- **User Manual**