General Description

BDE-BW335S is a 2.4-GHz & 5-GHz Wi-Fi 6 and Bluetooth Low Energy 5.4 combo wireless module series based on TI's 10th generation connectivity combo chip, which is based upon proven technology and complements of TI integrated devices for connectivity portfolio. This module series is ideal for use in cost sensitive embedded applications with a Linux or RTOS host running TCP/IP, where the peak throughput requirement is 50 Mbps maximum at the IP layer. BDE-BW335S module series could be the best choice for bringing the efficiency of Wi-Fi 6 to embedded device applications with a small PCB footprint and highly optimized bill of materials with lower cost. The module is backward compatible with Wi-Fi 4 (802.11 b/g/n) and Wi-Fi 5 (802.11 ac).

Device operating in the 5150-5250 MHz band under RSS-247 must include a user manual statement that indicates the device is for indoor use only.

In order to fulfil different integration requirements, BDE provides different variants. They are listed in Table 1.

Table 1. Module Variants

Orderable Part Number	Connectivity	Antenna Options	Antenna Diversity Support	Operating Temperature
BDE-BW3351N1	Wi-Fi 6 2.4-GHz & 5-GHz SISO & BLE 5.4	ANT pin	Not supported	-40 °C to +85 °C
BDE-BW3351U1	Wi-Fi 6 2.4-GHz & 5-GHz SISO & BLE 5.4	U.FL connector	Not supported	-40 °C to +85 °C
BDE-BW3351A1	Wi-Fi 6 2.4-GHz & 5-GHz SISO & BLE 5.4	PCB trace antenna	Not supported	-40 °C to +85 °C
BDE-BW3350N1	Wi-Fi 6 2.4-GHz & 5-GHz SISO & BLE 5.4	ANT pin	Not supported	-40 °C to +85 °C
BDE-BW3350U1	Wi-Fi 6 2.4-GHz & 5-GHz SISO & BLE 5.4	U.FL connector	Not supported	-40 °C to +85 °C
BDE-BW3350A1	Wi-Fi 6 2.4-GHz & 5-GHz SISO & BLE 5.4	PCB trace antenna	Not supported	-40 °C to +85 °C
BDE-BW3351N1-IN	Wi-Fi 6 2.4-GHz & 5-GHz SISO & BLE 5.4	ANT pin	Not supported	-40 °C to +105 °C
BDE-BW3351U1-IN	Wi-Fi 6 2.4-GHz & 5-GHz SISO & BLE 5.4	U.FL connector	Not supported	-40 °C to +105 °C
BDE-BW3351A1-IN	Wi-Fi 6 2.4-GHz & 5-GHz SISO & BLE 5.4	PCB trace antenna	Not supported	-40 °C to +105 °C
BDE-BW3350N1-IN	Wi-Fi 6 2.4-GHz & 5-GHz SISO & BLE 5.4	ANT pin	Not supported	-40 °C to +105 °C
BDE-BW3350U1-IN	Wi-Fi 6 2.4-GHz & 5-GHz SISO & BLE 5.4	U.FL connector	Not supported	-40 °C to +105 °C
BDE-BW3350A1-IN	Wi-Fi 6 2.4-GHz & 5-GHz SISO & BLE 5.4	PCB trace antenna	Not supported	-40 °C to +105 °C

Note: The -IN model can support a higher temperature range because the components of the same model are used, but the temperature ranges supported by these components are different, so the temperature range that the entire module can support is also different.

Key Features

- Highly optimized Wi-Fi 6 and Bluetooth Low Energy 5.4 system for low cost embedded IoT applications
- Seamless integration with any processor or MCU host capable of running a TCP/IP stack
- Integrated 2.4-GHz & 5-GHz PA for complete wireless solution with up to +20 dBm output power
- Application throughput up to 50 Mbps
- Wi-Fi 6
  - 2.4 GHz & 5-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 supporting WPA2 and WPA3
- Excellent interoperability
- Support for 4 bit 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
- Enhanced Security
  - Secured host interface
  - Firmware authentication
  - Anti-rollback protection
- Multirole support (for example, concurrent STA and AP) to connect with Wi-Fi devices on different RF channels (Wi-Fi networks)
- 3-wire or 1-wire PTA for external coexistence with additional 2.4-GHz radios (for example, Thread or Zigbee)
- Operating temperature: -40°C to +85°C or -40°C to +105°C
- Power Management

- VDD_1V8: 1.62 V - 1.98 V
- VDD_3V3: 2.1 V - 4.2 V
- Clock Source
  - On-board 40 MHz XTAL fast clock
  - External 32.768-kHz slow clock by default
- Antenna Options
  - ANT pin for external antenna
  - U.FL connector for external antenna
  - Integrated PCB trace antenna
- Package
  - 65-QFM, 11-mm x 11-mm x 2-mm
  - 65-QFM, 11-mm x 15-mm x 2-mm
- Qualification and Regulatory Compliance
  - Bluetooth SIG
  - FCC
  - IC
  - TELEC
  - CE-RED

Applications

- Grid Infrastructure
  - Electricity Meter
  - String Inverter
  - Micro Inverter
  - Energy Storage Power Conversion System (PCS)
  - EV Charging Infrastructure
- Building and Home Automation
  - HVAC Controller
  - HVAC Gateway
  - Thermostat
  - Building Security Gateway
  - Garage Door System
  - IP Network Camera/ Video Doorbell
  - Wireless Security Camera
- Appliances
  - Refrigerator & Freezer
  - Oven
  - Washer & Dryer

- Residential Water Heater & Heating System
- Air Purifier & Humidifier
- Coffee Machine
- Air Conditioner Indoor Unit
- Vacuum Robot
- Robotic Lawn Mower
- Medical
  - Infusion Pump
  - Electronic Hospital Bed & Bed Control
  - Multiparameter Patient Monitor
  - Blood Pressure Monitor
  - CPAP Machine
  - Telehealth Systems
  - Ultrasound Scanner
  - Ultrasound Smart Probe
  - Electric Toothbrush
- Retail Automation and Payment
- Printers

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1. CC3351 resources: https://www.ti.com/product/CC3351;

1. System Overview

1.1. Block Diagram

BDE-BW335S module series is based on the TI's 10th generation connectivity combo chip. The module series, as seen in below diagrams, depending on different configurations, comprises of:

- 40-MHz XTAL
- Bandpass filter
- Decoupling capacitors
- U.FL connector (U.FL variants)
- PCB trace antenna (BDE-BW335XA1)
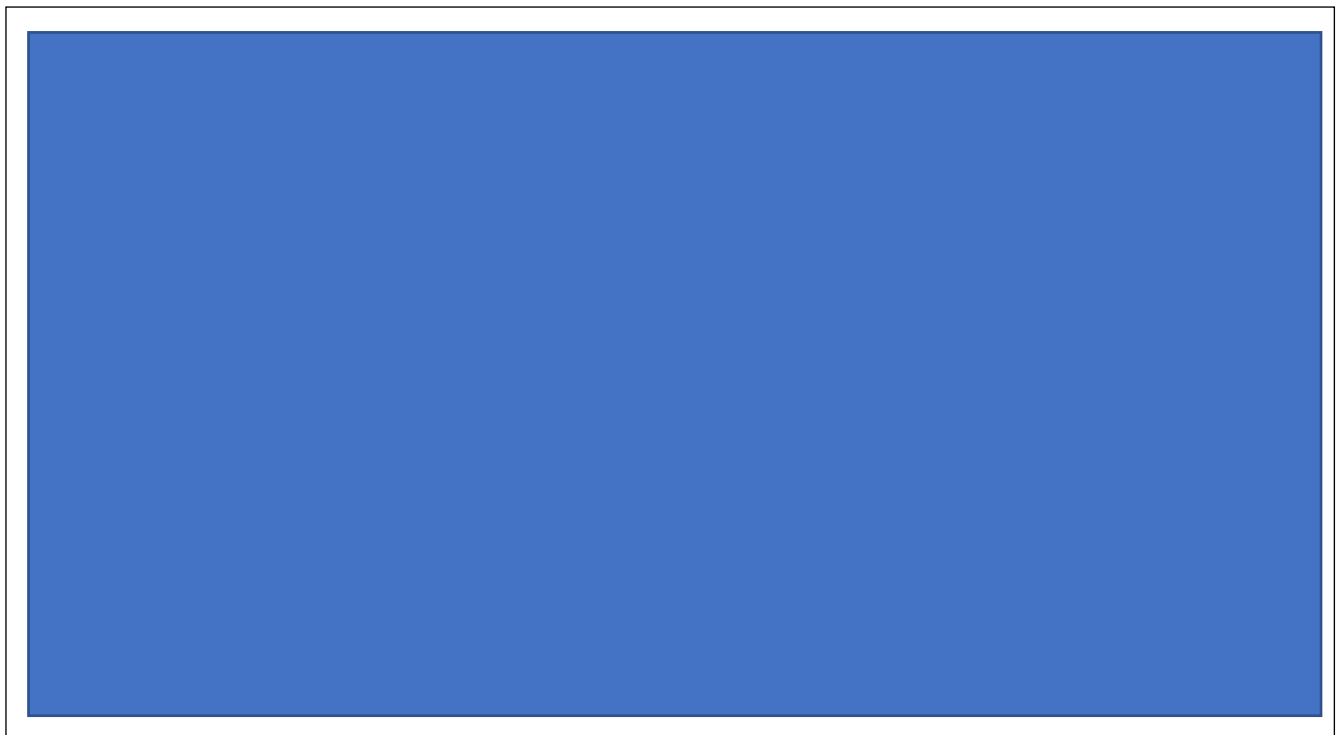
Figure 1. The block diagram of BDE-BW335XN1

Figure 2. The block diagram of BDE-BW335XU1

Figure 3. The block diagram of BDE-BW335XA1
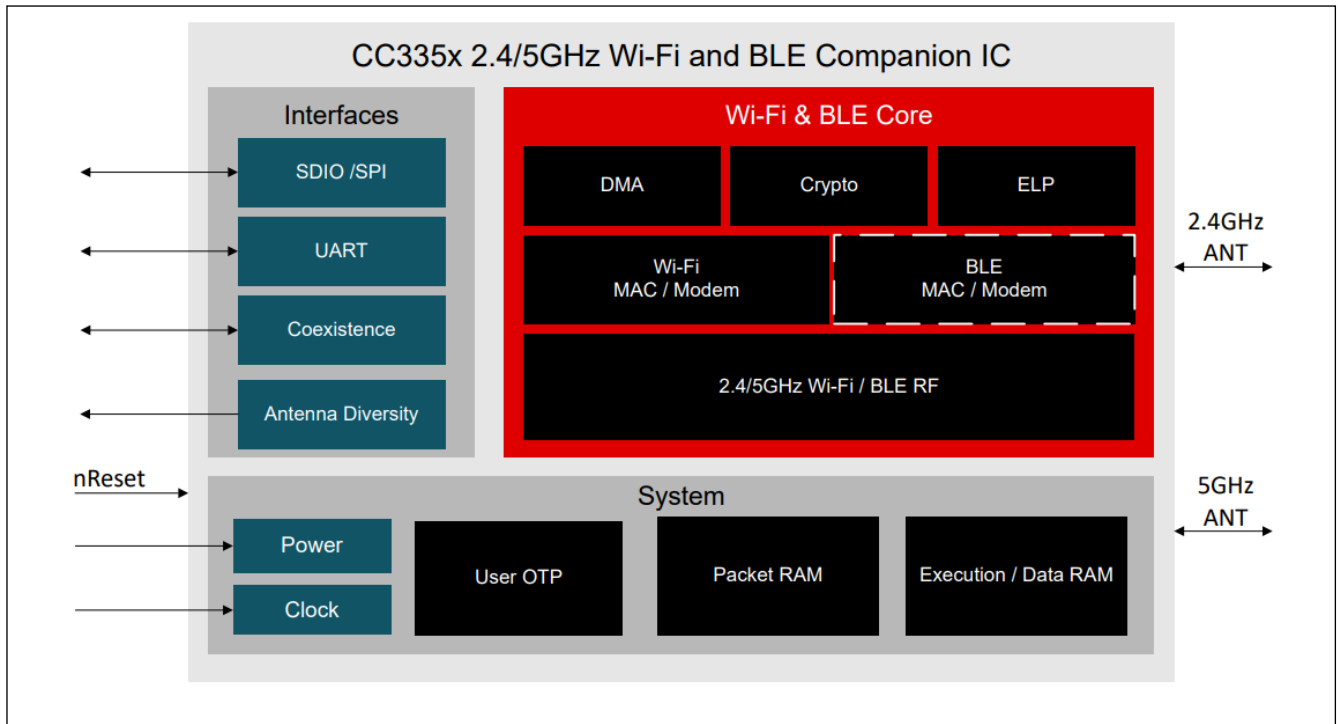
Figure 4. The block diagram of CC3351 (Adopted form CC3351 Datasheet)

2. Pinout Functions

2.1. Pin Diagram
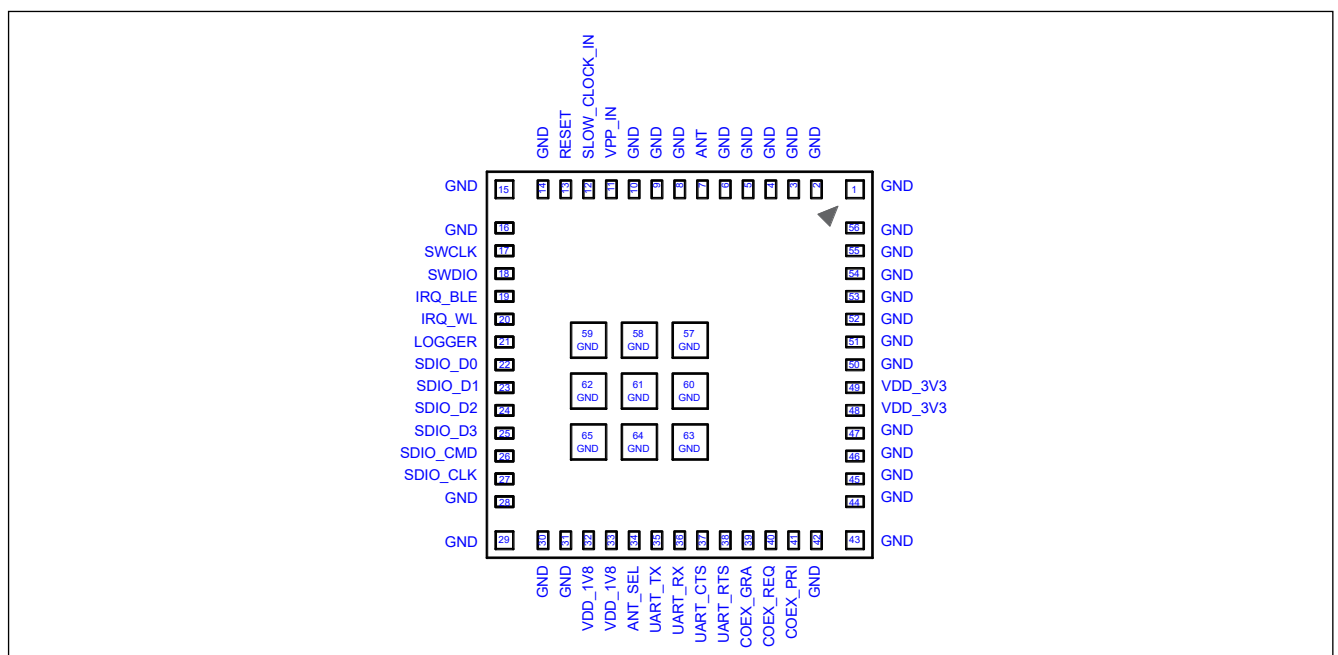
Figure 5. Pin Diagram of BDE-BW335XN1 (Bottom View)
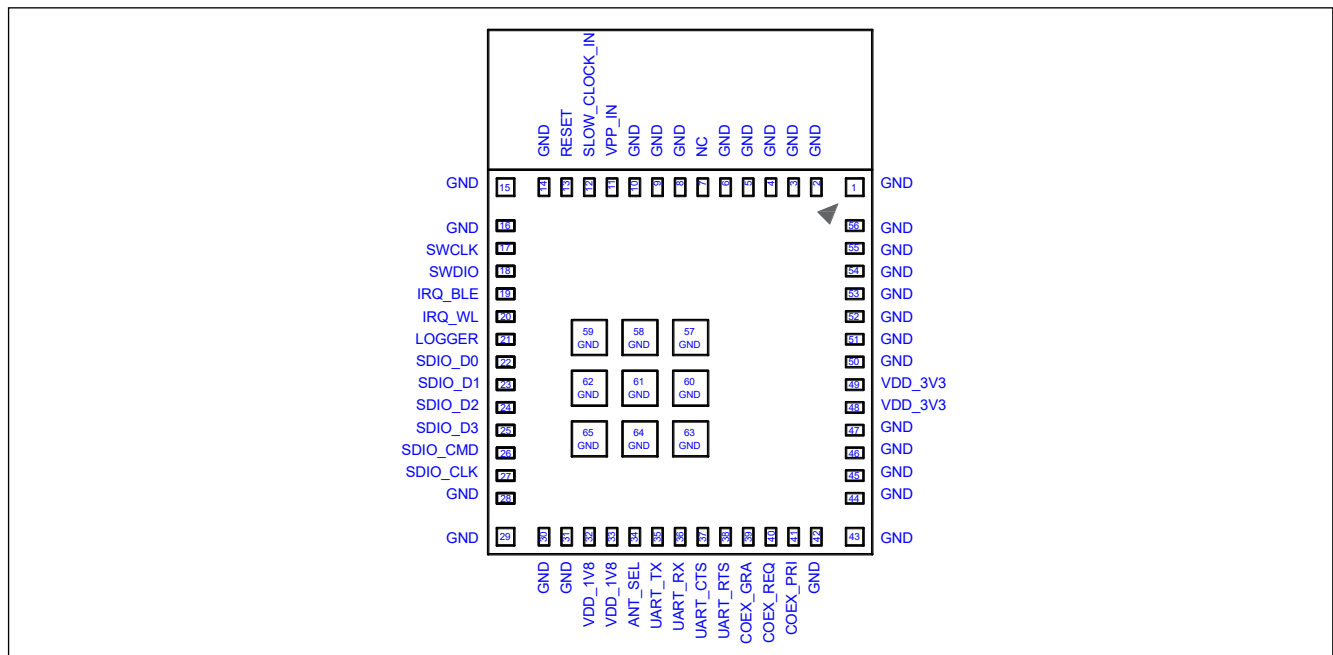
Figure 6. Pin Diagram of BDE-BW335XA1, BDE-BW335XU1 (Bottom View)

2.2. Pinout Description

Table 2. Pinout Description

Module Pin #	Pin Name	Type	Description
1	GND	Ground	Power ground
2	GND	Ground	Power ground
3	GND	Ground	Power ground
4	GND	Ground	Power ground
5	GND	Ground	Power ground
6	GND	Ground	Power ground
7	ANT	ANT	Bluetooth Low Energy and WLAN 2.4-GHz & 5-GHz antenna port
8	GND	Ground	Power ground
9	GND	Ground	Power ground
10	GND	Ground	Power ground
11	VPP_IN	Power	1.8-V OTP programming input supply, connect to VDD_1V8
12	SLOW_CLK_IN	I	External slow clock input
13	RESET	I	Reset, active low
14	GND	Ground	Power ground
15	GND	Ground	Power ground
16	GND	Ground	Power ground
17	SWCLK	I	Serial Wire CLK
18	SWDIO	I/O	Serial Wire DIN/DOUT
19	IRQ_BLE	O	IRQ_BLE to host (in shared SDIO mode)
20	IRQ_WL	O	IRQ_WL to host
21	LOGGER	O	Tracer (UART TX debug logger)
22	SDIO_D0	I/O	SDIO_D0_WL (SPI_DOUT)
23	SDIO_D1	I/O	SDIO_D1_WL.
24	SDIO_D2	I/O	SDIO_D2_WL

Module Pin #	Pin Name	Type	Description
25	SDIO_D3	I/O	SDIO_D3_WL (SPI_CSX)
26	SDIO_CMD	I	SDIO_CMD_WL (SPI_DIN)
27	SDIO_CLK	I	SDIO_CLK_WL (SPI_CLK). Must be driven by host
28	GND	Ground	Power ground
29	GND	Ground	Power ground
30	GND	Ground	Power ground
31	GND	Ground	Power ground
32	VDD_1V8	Power	1.8V power supply
33	VDD_1V8	Power	1.8V power supply
34	ANT_SEL	O	Antenna select control for antenna diversity
35	UART_TX	0	UART TX for BLE HCI
36	UART_RX	I	UART RX for BLE HCI
37	UART_CTS	I	UART CTS for flow control for BLE HCI
38	UART_RTS	O	UART RTS for flow control for Bluetooth Low Energy HCI
39	COEX_GRA	O	External coexistence interface - grant
40	COEX_REQ	I	External coexistence interface – request
41	COEX_PRI	I	External coexistence interface – priority
42	GND	Ground	Power ground
43	GND	Ground	Power ground
44	GND	Ground	Power ground
45	GND	Ground	Power ground
46	GND	Ground	Power ground
47	GND	Ground	Power ground
48	VDD_3V3	Power	3.3V power supply
49	VDD_3V3	Power	3.3V power supply
50	GND	Ground	Power ground
51	GND	Ground	Power ground
52	GND	Ground	Power ground
53	GND	Ground	Power ground
54	GND	Ground	Power ground
55	GND	Ground	Power ground
56	GND	Ground	Power ground
57 -65	GND	Ground	Thermal pads, connect to GND

Note:

(1) All digital I/Os are with internal PU/PD according to the "shutdown state" column when the device is in shutdown mode (with the exception of SDIO signals are Hi-Z). PU means pull-up, PD means pull-down, Hi-Z means high impedance;
(2) LOGGER and IRQ_WL pins are sensed by the device during boot. They should be kept "10" state on power-up with LOGGER pin being high.

3. Characteristics

3.1. Electrical Characteristics

3.1.1. Absolute Maximum Ratings

Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. These are stress ratings only, so functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specification are not implied. Exposure to Absolute Maximum Rating conditions for extended periods may affect device reliability.

Table 3. Absolute Maximum Ratings

Parameter	MIN	MAX	Unit
VDD_3V3	-0.5	4.2	V
VDD_1V8	-0.5	2.1	V
Operating ambient temperature	-40	105	°C
Storage temperature	-40	105	°C

3.1.2. ESD Ratings

Table 4. ESD Ratings

Parameter	Description	Value	Unit	Note
Electrostatic discharge	Contact discharge	4000	V	As per EN 301-489
	Air discharge	8000	V	As per EN 301-489

3.1.3. Recommended Operating Conditions

Table 5. Recommended Operating Conditions

Parameter	MIN	TYP	MAX	Unit
VDD_3V3	3	3.3	3.6	V
VDD_1V8	1.62	1.8	1.98	V
Operating ambient temperature	-40		85	°C
Operating ambient temperature (-IN variants)	-40		105 [1]	°C

Note:

(1) -IN variants module may operate at temperature of up to 105 °C. This allows the device to be used reliably in applications that may be exposed to higher ambient temperature over certain periods of the product's life. At temperatures higher than 85 °C, the WLAN/BLE performance may degrade.

3.1.4. I/O DC Characteristics

Table 6. I/O DC Characteristics

Parameter	Description	Test Condition	MIN	TYP	MAX	Unit
V_{IH}	High level input voltage		0.65 x VDD_1V8		VDD_1V8	V
V_{IL}	Low level input voltage		0		0.35 x VDD_1V8	V
V_{OH}	High level output voltage	At 4mA	VDD_1V8 – 0.45		VDD_1V8	V
V_{OL}	Low level output voltage	At 4mA	0		0.45	V

3.1.5. Power Consumption

The measurement is made with the evaluation module (EM board) BDE-BW33N-EM at room temperature, unless otherwise noted.

Table 7. Current Consumption – WLAN 2.4-GHz Static Modes

Parameter	Test Condition		Supply	TYP	Unit
Continuous TX [1]	1 DSSS	TX power = 20 dBm	VDD_1V8	100	mA
			VDD_3V3	210	
	6 OFDM	TX power = 20 dBm	VDD_1V8	105	
			VDD_3V3	220	
	54 OFDM	TX power = 17 dBm	VDD_1V8	100	
			VDD_3V3	178	
	HT MCS0	TX power = 20 dBm	VDD_1V8	107	
			VDD_3V3	214	
	HT MCS7	TX power = 17 dBm	VDD_1V8	105	
			VDD_3V3	165	
	HE MCS0	TX power = 20 dBm	VDD_1V8	105	
			VDD_3V3	215	
	HE MCS7	TX power = 20 dBm	VDD_1V8	100	
			VDD_3V3	188	
Continuous RX			VDD_1V8	62	
			VDD_3V3	0	

Note:

(1) Peak current VDD_3V3 can hit 340mA during device calibration; Peak current VDD_1V8 of 185mA including peripherals and internal cortex.

Table 8. Current Consumption – WLAN 2.4-GHz Use Cases

Mode	Description	TYP	Unit
DTIM = 1	System with 3.3V to Ext. DC/DC at 85% efficiency WLAN beacon reception every DTIM=1 (~102ms)	637	µA
	System with 1.8V WLAN beacon reception every DTIM=1 (~102ms)	980	
DTIM = 3	System with 3.3V to Ext. DC/DC at 85% efficiency WLAN beacon reception every DTIM=1 (~102ms)	371	
	System with 1.8V WLAN beacon reception every DTIM=1 (~102ms)	570	
DTIM = 5	System with 3.3V to Ext. DC/DC at 85% efficiency WLAN beacon reception every DTIM=1 (~102ms)	319	
	System with 1.8V WLAN beacon reception every DTIM=1 (~102ms)	490	

Table 9. Current Consumption – WLAN 5-GHz Static Modes

Parameter	Test Condition		Supply	TYP	Unit
Continuous TX	6 OFDM	TX power = 20 dBm	VDD_1V8	170	mA
			VDD_3V3	250	
	54 OFDM	TX power = 15 dBm	VDD_1V8	175	
			VDD_3V3	190	
	HT MCS0	TX power = 20 dBm	VDD_1V8	175	
			VDD_3V3	250	
	HT MCS7	TX power = 15 dBm	VDD_1V8	175	
			VDD_3V3	190	
	HE MCS0	TX power = 20 dBm	VDD_1V8	170	
			VDD_3V3	250	
	HE MCS7	TX power = 15 dBm	VDD_1V8	175	
			VDD_3V3	190	
Continuous RX			VDD_1V8	110	
			VDD_3V3	0	

Note:

(2) Peak current VDD_3V3 can hit 450mA during device calibration; Peak current VDD_1V8 of 300mA including peripherals and internal cortex.

Table 10. Current Consumption –WLAN 5-GHz Use Cases

Mode	Description	TYP	Unit
DTIM = 1	System with 3.3V to Ext. DC/DC at 85% efficiency WLAN beacon reception every DTIM=1 (~102ms)	735	µA
	System with 1.8V WLAN beacon reception every DTIM=1 (~102ms)	1130	
DTIM = 3	System with 3.3V to Ext. DC/DC at 85% efficiency WLAN beacon reception every DTIM=1 (~102ms)	390	
	System with 1.8V WLAN beacon reception every DTIM=1 (~102ms)	600	
DTIM = 5	System with 3.3V to Ext. DC/DC at 85% efficiency WLAN beacon reception every DTIM=1 (~102ms)	340	
	System with 1.8V WLAN beacon reception every DTIM=1 (~102ms)	520	

Table 11. Current Consumption – BLE Static Modes

Parameter	Test Condition	Supply	TYP	Unit
TX, max duty cycle	TX power = 0 dBm	VDD_1V8	104	mA
		VDD_3V3	40	
	TX power = 10 dBm	VDD_1V8	100	
		VDD_3V3	98	
	TX power = 20 dBm	VDD_1V8	105	
		VDD_3V3	220	
RX		VDD_1V8	62	
		VDD_3V3	0	

Table 12. Current Consumption – Device States

Mode	Description	Supply	TYP	Unit
Shutdown	External supplies are available, device held in reset (nRESET is low)	VDD_1V8	10	μA
		VDD_3V3	2	
Sleep	Low power mode – RAM in retention	VDD_1V8	330	
		VDD_3V3	2	

3.1.6. Fast Clock Characteristics

The fast clock running at 40-MHz for WLAN/BLE functions is included in the module. The specification is shown in below table.

Table 13. 40-MHz Crystal Oscillator (HFXT) Characteristics

Parameter	Test Condition	MIN	TYP	MAX	Unit
Crystal frequency			40		MHz
ESR, Equivalent series resistance				20	Ω
Frequency tolerance	T_A: 25°C	-10		+10	ppm
Frequency stability	T_A: -40°C ~ 85°C/105°C [1]	-30		+30	ppm
C_L, Crystal load capacitance			8		pF

Note:

(1) -IN variants can support up to 105 °C.

3.1.7. External Slow Clock Requirements

The slow clock running at 32.768-KHz for low power modes is not included in the module. The slow clock can be generated internally or externally. The external slow clock requirements are listed in below table.

Table 14. External 32.768-KHz Slow Clock Requirements

Parameter	Description	MIN	TYP	MAX	Unit
Crystal frequency	Square wave		32768		Hz
Frequency accuracy	Initial + temperature + aging	-250		+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
Input low level		0		0.35 x VDD_1V8	V
Input high level		0.65 x VDD_1V8		1.95	V
Input impedance		1			MΩ
Input capacitance				5	pF

3.1.8. Power Supply Sequencing

For proper operation of the module, perform the recommended power-up sequencing as follows:
1. VDD_3V3 and VDD_1V8 must be available before nRESET is released;
2. For an external slow clock, ensure that the clock is stable before nRESET is deasserted (high);
3. The nRESET pin should be held low for at least 10 us after stabilization of the external power supplies.

3.1.9. SDIO Timing Characteristics

SDIO is the main host interfaces for WLAN, and it supports a maximum clock rate of 52-MHz. The module also supports shared SDIO interface for both BLE and WLAN.

The timing diagram for default speed and high speed SDIO are as follows:
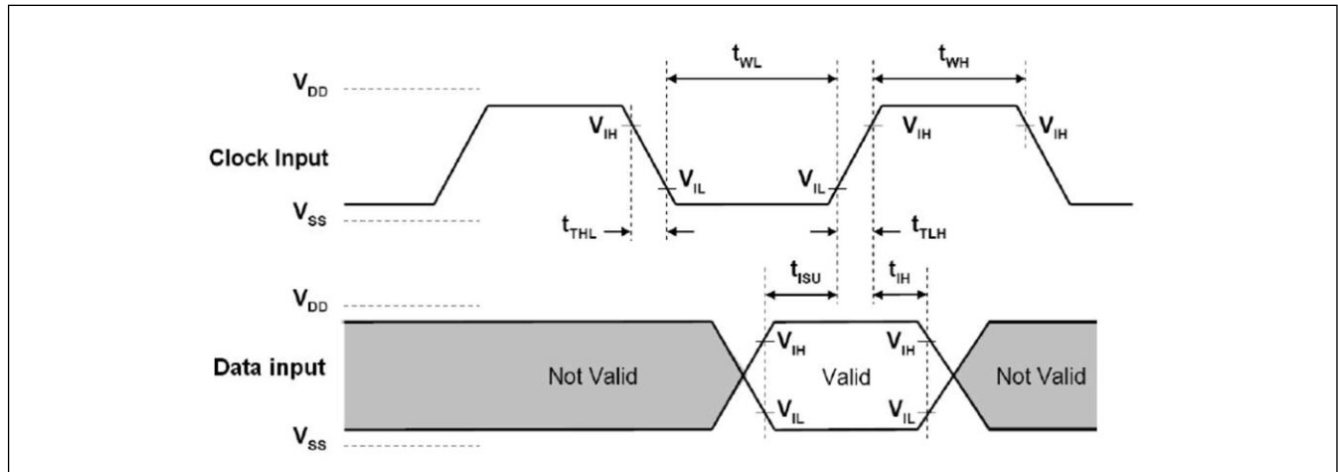
Figure 7. SDIO Default Input Timing
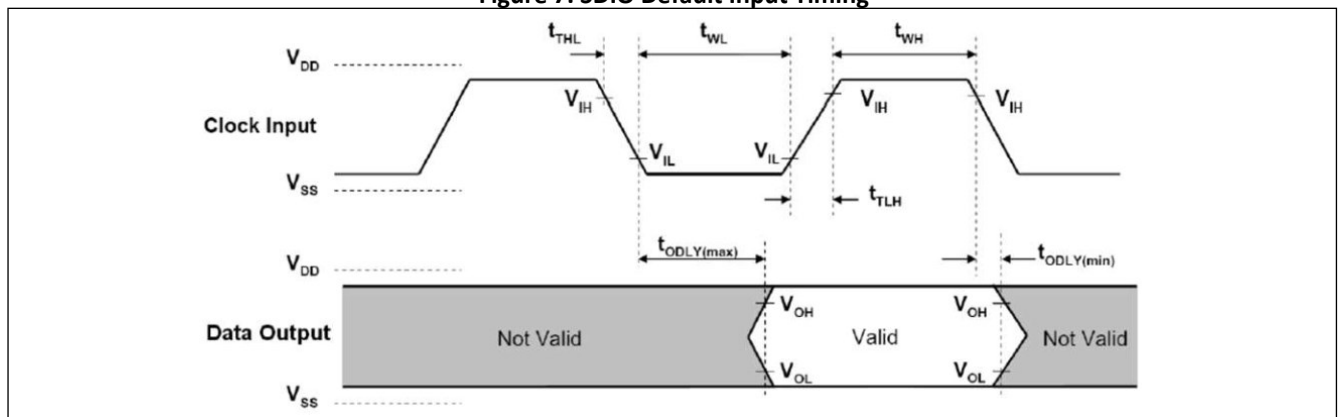
Figure 8. SDIO Default Output Timing

Table 15. SDIO Timing Parameters - Default Speed

Parameter	Description	MIN	MAX	Unit
f_{clock}	Clock frequency, CLK		26	MHz
t_{High}	High period	10		
t_{Low}	Low period	10		
t_{TLH}	Rise time, CLK		10	
t_{THL}	Fall time, CLK		10	ns
t_{ISU}	Setup time, input valid before CLK ↑	5		
t_{IH}	Hold time, input valid after CLK ↑	5		
t_{ODLY}	Delay time, CLK ↓ to output valid	2	14	
C_L	Capacitive load on outputs	15	40	pF
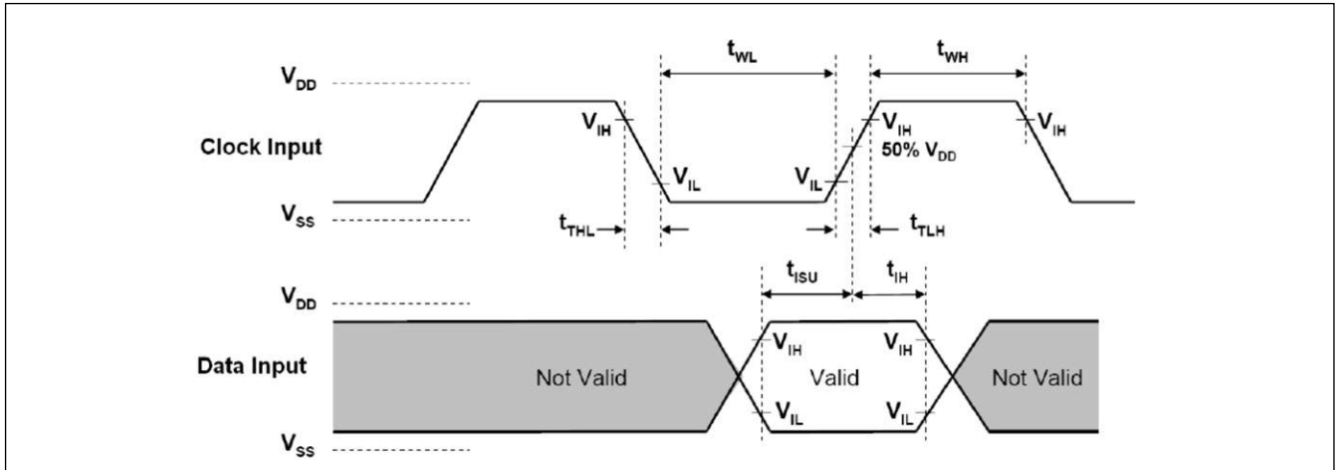
Figure 9. SDIO High Speed Input Timing
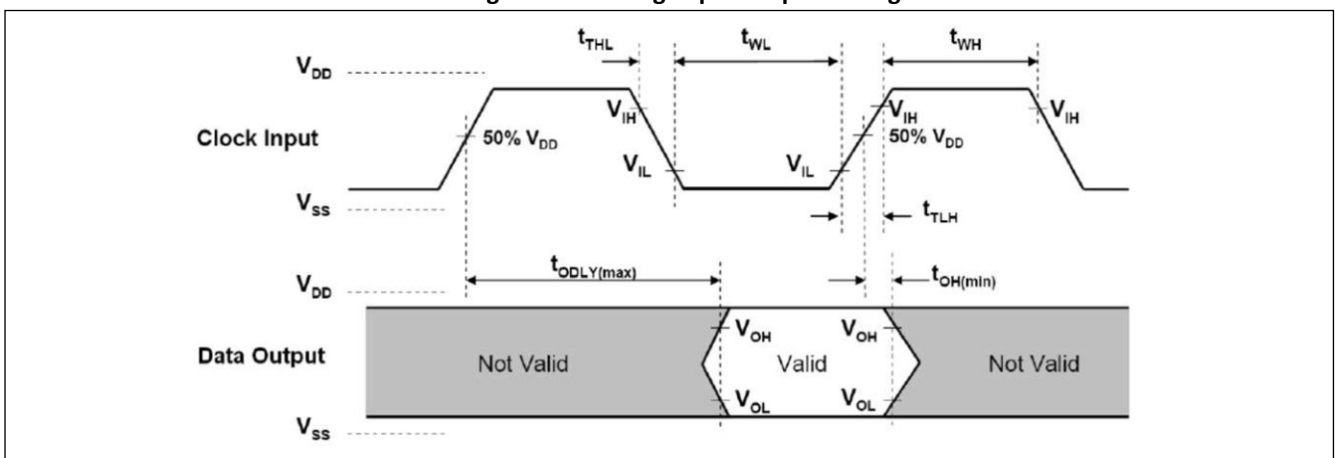
Figure 10. SDIO High Speed Output Timing

Table 16. SDIO Timing Parameters - High Speed

Parameter	Description	MIN	MAX	Unit
f_{clock}	Clock frequency, CLK		52	MHz
t_{High}	High period	7		
t_{Low}	Low period	7		
t_{TLH}	Rise time, CLK		3	
t_{THL}	Fall time, CLK		3	ns
t_{ISU}	Setup time, input valid before CLK ↑	6		
t_{IH}	Hold time, input valid after CLK ↑	2		
t_{ODLY}	Delay time, CLK ↓ to output valid	2	14	
C_L	Capacitive load on outputs	15	40	pF

3.1.10. SPI Timing Characteristics

SPI is another host interface for WLAN. The module also supports shared SPI interface for both BLE and WLAN.

The timing diagram for SPI is as follows:
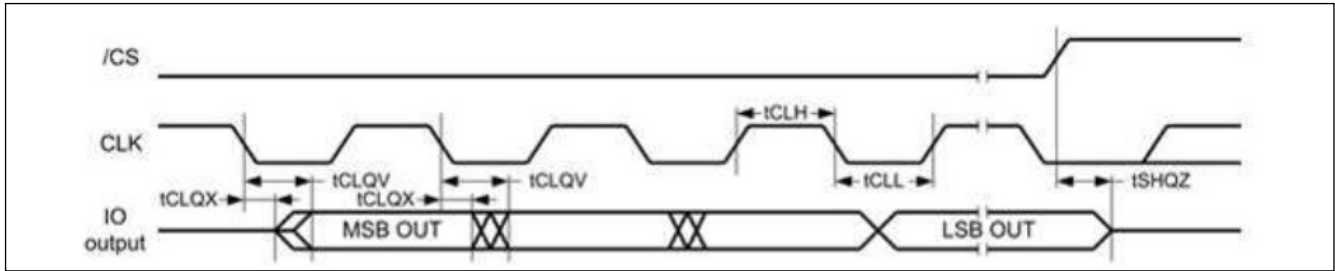
Figure 11. SDIO Default Input Timing
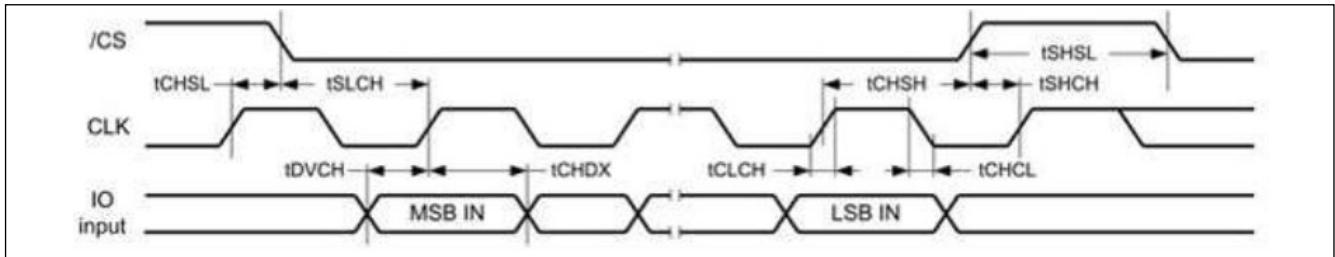
Figure 12. SPI Output Timing

Table 17. SPI Timing Parameters

Parameter	Description	MIN	MAX	Unit
f_{clock}	Clock frequency, CLK		26	MHz
t_{High}	High period	10		
t_{Low}	Low period	10		
t_{TLH}	Rise time, CLK		3	
t_{THL}	Fall time, CLK		3	
t_{CSU}	CS setup time, CS valid before CLK ↑	3		ns
t_{ISU}	PICO, input valid before CLK ↑	3		
t_{IH}	PICO Hold time, input valid after CLK ↑	3		
t_{Dr}, t_{Df} - Active	Delay time, CLK ↑/↓ to output valid	2	10	
t_{Dr}, t_{Df} - Sleep	Delay time, CLK ↑/↓ to output valid		12	
C_L	Capacitive load on outputs	15	40	pF

3.1.11. UART 4-Wire Interface

UART is the main host interface for BLE, which supports host controller interface (HCI) transport layer.

Table 18. UART Timing Parameters

Parameter	Description	MIN	TYP	MAX	Unit
Baud rate	Clock frequency, CLK	37.5		4364	kbps
Baud rate accuracy per byte	Receive/Transmit	-2.5		+1.5	%
Baud rate accuracy per bit	Receive/Transmit	-12.5		+12.5	%
CTS low to TX_DATA on		0	2		ms
CTS high to TX_DATA off	Hardware flow control			1	Byte
CTS high pulse width		1			bit
RTS low to RX_DATA on		0	2		ms
RTS high to RX_DATA off	Interrupt set to 1/4 FIFO			16	Byte

3.2. RF Characteristics

3.2.1. WLAN Performance: 2.4-GHz Receiver Characteristics

Table 19. WLAN Performance: 2.4-GHz Receiver Characteristics

Parameter	Test Condition	MIN	TYP	MAX	Unit
Operational frequency range		2412		2472	MHz
Sensitivity: 8% PER for 11b rates, 10% PER for 11g/n/ax rates	1 DSSS		-98		dBm
	2 DSSS		-95		
	11 DSSS		-90		
	6 OFDM		-93		
	54 OFDM		-75		
	HT MCS0 MM 4K		-93		

Parameter	Test Condition	MIN	TYP	MAX	Unit
	HT MCS7 MM 4K		-72		
	HE MCS0 4K		-92		
	HE MCS7 4K		-72		
Maximum input level: 8% PER for 11b rates, 10% PER for 11g/n/ax rates	1 DSSS		0		dBm
	6 OFDM, HT MCS0, HE MCS0		0		
	54 OFDM, HT MCS7, HE MCS7		-9		
Adjacent channel rejection	1 DSSS		45		dB
	2 DSSS		39		
	11 DSSS		20		
	6 OFDM		3		
	54 OFDM		20		
	HT MCS0 MM 4K		3		
	HT MCS7 MM 4K		16		
	HE MCS0 4K		-1		
RSSI accuracy	-90 dBm to -30 dBm	-3		3	dB

3.2.2. WLAN Performance: 5-GHz Receiver Characteristics

Table 20. WLAN Performance: 5-GHz Receiver Characteristics

Parameter	Test Condition	MIN	TYP	MAX	Unit
Operational frequency range		5180		5845	MHz
Sensitivity: 10% PER for 11g/n/ax rates	6 OFDM		-93		
	54 OFDM		-75		
	HT MCS0 MM 4K		-93		
	HT MCS7 MM 4K		-73		
	HE MCS0 4K		-92		
	HE MCS7 4K		-73		
Maximum input level: 10% PER for 11g/n/ax rates	6 OFDM, HT MCS0, HE MCS0		-23		dBm
	54 OFDM, HT MCS7, HE MCS7		-24		
Adjacent channel rejection	6 OFDM		20		dB
	54 OFDM		3		
	HT MCS0		18		
	HT MCS7		0		
	HE MCS0		16		
	HE MCS7		-1		
RSSI accuracy	-90 dBm to -30 dBm	-3		3	dB

3.2.3. WLAN Performance: 2.4-GHz Transmitter Characteristics

Table 21. WLAN Performance: 2.4-GHz Transmitter Power

Parameter	Test Condition	MIN	TYP	MAX	Unit
Operational frequency range		2412		2472	MHz
Output power at VDD_3V3 = 3.3 V	1 DSSS		20.5		dBm
	6 OFDM		20.2		
	54 OFDM		17.4		
	HT MCS0 MM 4K		20.2		
	HT MCS7 MM 4K		17.4		
	HE MCS0 4K		20.2		
	HE MCS7 4K		17.3		

Note:

(1) The output power is measured at frequency 2437MHz.

3.2.4. WLAN Performance: 5-GHz Transmitter Characteristics

Table 22. WLAN Performance: 5-GHz Transmitter Power

Parameter	Test Condition	MIN	TYP	MAX	Unit
Operational frequency range		5180		5845	MHz
Output power at VDD_3V3 = 3.3 V	6 OFDM		19.5		dBm
	54 OFDM		15		
	HT MCS0		19.5		
	HT MCS7		15		
	HE MCS0		19.5		
	HE MCS7		15		

Note:

(2) The output power is measured at frequency 5580MHz.

3.2.5. BLE Performance: Receiver Characteristics

Table 23. BLE Performance: 2.4-GHz Receiver Characteristics

Parameter	Test Condition	MIN	TYP	MAX	Unit
BLE 125Kbps (LE Coded) Receiver Characteristics					
Receiver sensitivity	PER <30.8%		-102		dBm
Receiver saturation	PER <30.8%		0		
Co-channel rejection [1]	Wanted signal at -79 dBm, modulated interferer in channel		10		
Selectivity, ±1 MHz [1]	Wanted signal at -79 dBm, modulated interferer at ±1 MHz		0 / 0 [2]		
Selectivity, ±2 MHz [1]	Wanted signal at -79 dBm, modulated interferer at ±2 MHz		-37 / -30 [2]		dB
Selectivity, ±3 MHz [1]	Wanted signal at -79 dBm, modulated interferer at ±3 MHz		-39 / -36 [2]		
Selectivity, ±4 MHz [1]	Wanted signal at -79 dBm, modulated interferer at ±4MHz		-45 / -41 [2]		
RSSI accuracy	-90 dBm to -20 dBm	-4		4	
BLE 500Kbps (LE Coded) Receiver Characteristics					
Receiver sensitivity	PER <30.8%		-99		dBm
Receiver saturation	PER <30.8%		0		
Co-channel rejection [1]	Wanted signal at -72 dBm, modulated interferer in channel		10		
Selectivity, ±1 MHz [1]	Wanted signal at -72 dBm, modulated interferer at ±1 MHz		0 / 0 [2]		
Selectivity, ±2 MHz [1]	Wanted signal at -72 dBm, modulated interferer at ±2 MHz		-35 / -25 [2]		dB
Selectivity, ±3 MHz [1]	Wanted signal at -72 dBm, modulated interferer at ±3 MHz		-40 / -37 [2]		
Selectivity, ±4 MHz [1]	Wanted signal at -72 dBm, modulated interferer at ±4MHz		-45 / -40 [2]		
RSSI accuracy	-90 dBm to -20 dBm	-4		4	
BLE 1Mbps (LE 1M) Receiver Characteristics					
Receiver sensitivity	PER <30.8%, 37-byte packets		-99		
Receiver sensitivity	PER <30.8%, 255-byte packets		-98		dBm
Receiver saturation	PER <30.8%		0		
Co-channel rejection [1]	Wanted signal at -67 dBm, modulated interferer in channel		10		
Selectivity, ±1 MHz [1]	Wanted signal at -67 dBm, modulated interferer at ±1 MHz		0 / 0 [2]		
Selectivity, ±2 MHz [1]	Wanted signal at -67 dBm, modulated interferer at ±2 MHz		-35 / -28 [2]		dB
Selectivity, ±3 MHz [1]	Wanted signal at -67 dBm, modulated interferer at ±3 MHz		-38 / -32 [2]		
Selectivity, ±4 MHz [1]	Wanted signal at -67 dBm, modulated interferer at ±4MHz		-45 / -40 [2]		
Out-of-band blocking	30 MHz to 2000 MHz, wanted signal at -67 dBm		-23		
Out-of-band blocking	2003 MHz to 2399 MHz, wanted signal at -67 dBm		-30		
Out-of-band blocking	2484 MHz to 2997 MHz, wanted signal at -67 dBm		-30		dBm
Out-of-band blocking	3000 MHz to 6 GHz, wanted signal at -67 dBm		-21		
Intermodulation	Wanted signal at 2402 MHz, -64 dBm, two interferers at 2405 and 2408 MHz respectively, at the given power level		-40		
RSSI accuracy	-90 dBm to -20 dBm	-4		4	dB
BLE 2Mbps (LE 2M) Receiver Characteristics					
Receiver sensitivity	PER <30.8%, 37-byte packets		-95		dBm
Receiver saturation	PER <30.8%		0		
Co-channel rejection [1]	Wanted signal at -67 dBm, modulated interferer in channel		10		
Selectivity, ±2 MHz [1]	Wanted signal at -67 dBm, modulated interferer at ±1 MHz		0 / 0 [2]		
Selectivity, ±4 MHz [1]	Wanted signal at -67 dBm, modulated interferer at ±2 MHz		-35 / -28 [2]		dB
Selectivity, ±6 MHz [1]	Wanted signal at -67 dBm, modulated interferer at ±3 MHz		-35 / -28 [2]		
Alternate channel rejection, ±8 MHz [1]	Wanted signal at -67 dBm, modulated interferer at ±8MHz		-37 / -32 [2]		
Out-of-band blocking	30 MHz to 2000 MHz, wanted signal at -67 dBm		-23		
Out-of-band blocking	2003 MHz to 2399 MHz, wanted signal at -67 dBm		-30		
Out-of-band blocking	2484 MHz to 2997 MHz, wanted signal at -67 dBm		-30		dBm
Out-of-band blocking	3000 MHz to 6 GHz, wanted signal at -67 dBm		-21		
Intermodulation	Wanted signal at 2402 MHz, -64 dBm, two interferers at 2405 and 2408 MHz respectively, at the given power level		-44		
RSSI accuracy	-90 dBm to -20 dBm	-4		4	dB

Note:

(1) Numbers given as C/I dB;
(2) X / Y, where X is +N MHz and Y is –N M;

3.2.6. BLE Performance: Transmitter Characteristics

Table 24. BLE Performance: Transmitter Characteristics

Parameter	Test Condition	MIN	TYP Peak Power	TYP Average Power	MAX	Unit
Operational frequency range		2402	20		2480	MHz
Output power	Highest setting		20			dBm

Note:

(1) The output power is measured at frequency 2440MHz.

4. Mechanical Specifications

4.1. Module Dimensions

The module dimensions ae shown in following figures:
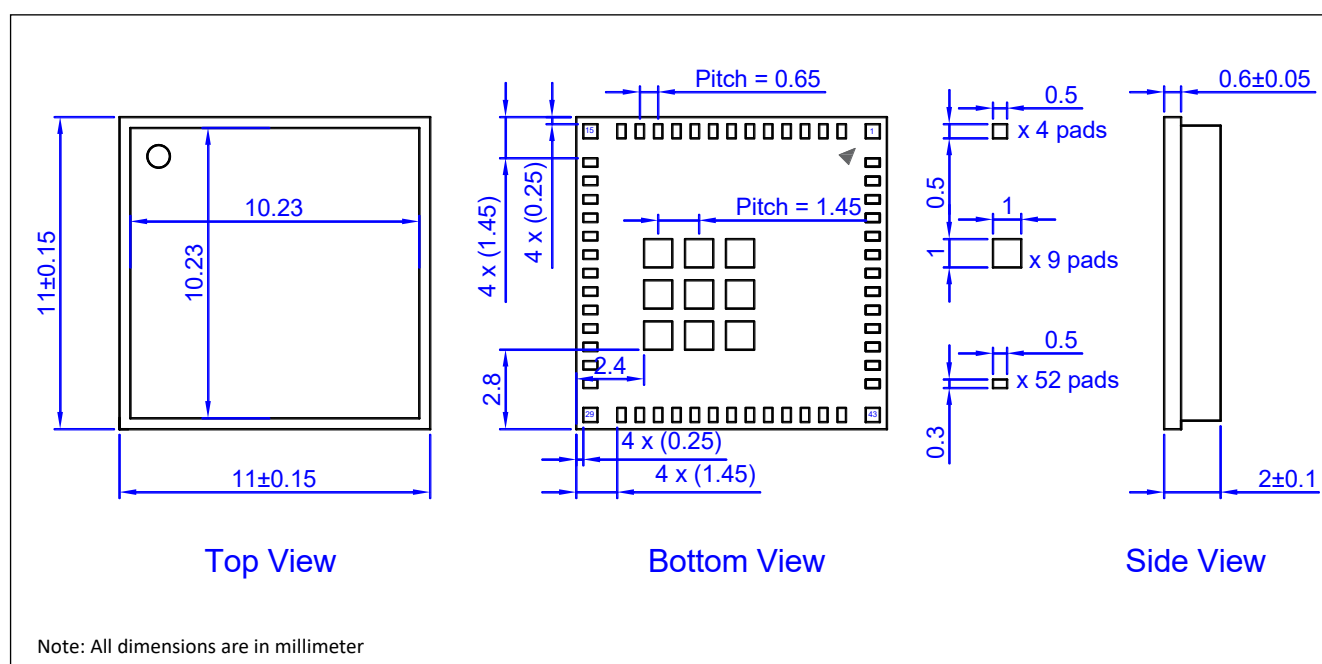
Figure 13. Mechanical Drawing of BDE-BW335XN1

Top View   Bottom View   Side View

Note: All dimensions are in millimeter
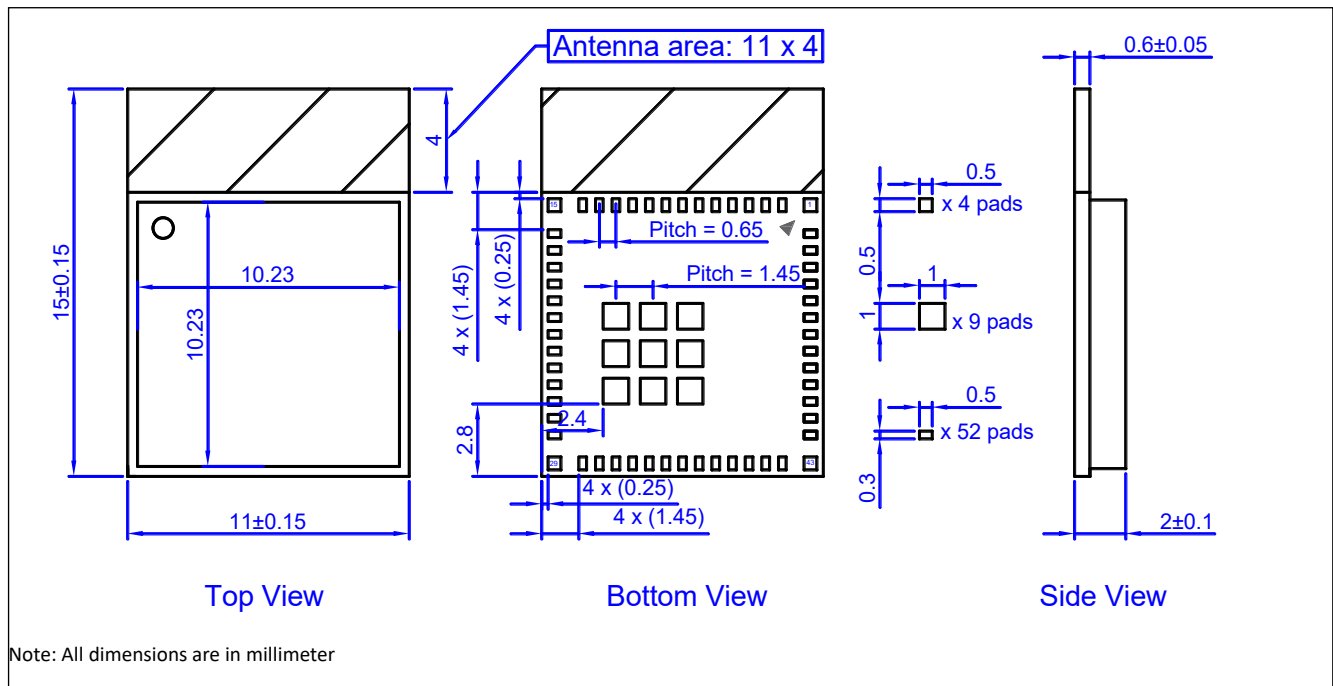
Figure 14. Mechanical Drawing of BDE-BW335XA1, BDE-BW335XU1

4.2. U.FL Connector Specification

The drawing and specification of the U.FL connector utilized in the module is as below for reference.

The dimension unit in below drawing is millimeter.
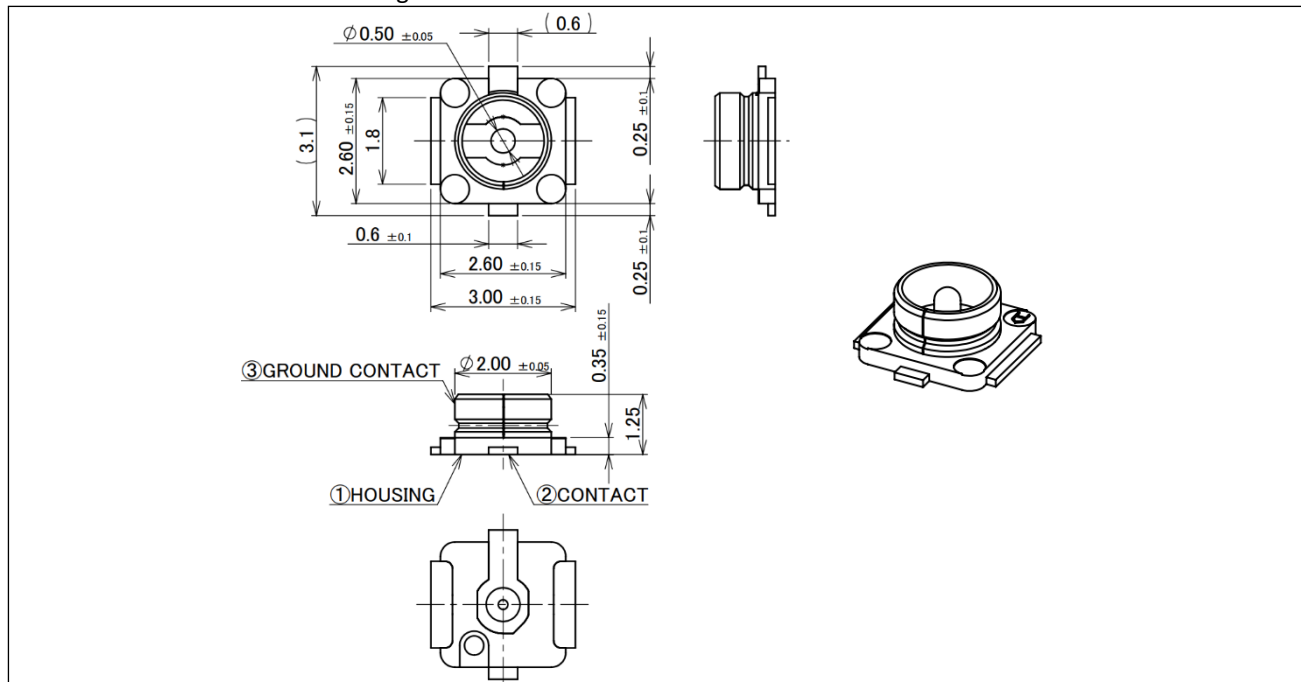
RATING VOLTAGE	60 V AC (R.M.S)	
RATING FREQUENCY	DC～9GHz	
OPERATING TEMPERATURE	233～363K (−40℃～+90℃)	
VSWR	RECEPTACLE: 1.3 MAX. AT 0.1～3 GHz, 1.4 MAX. AT 3～6 GHz, 1.8 MAX. AT 6～9 GHz	
MAIN CONTACT RESISTANCE	INITIAL: 20 mohm MAX. / AFTER TEST: ⊿R 20 mohm MAX.	
GROUND CONTACT RESISTANCE	INITIAL: 20 mohm MAX. / AFTER TEST: ⊿R 100 mohm MAX.	
INSULATION RESISTANCE	INITIAL: 500 Mohm MIN. / AFTER TEST: 100 Mohm MIN.	
DIELECTRIC WITHSTANDING VOLTAGE	200 V AC, 1 MINUTE	
DURABILITY	30 CYCLES	
UNMATING FORCE (INITIAL / AFTER TEST)	INITIAL: 5 N MIN. AFTER TEST: 3 N MIN.	INITIAL: 4 N MIN. AFTER TEST: 2 N MIN.

Figure 15. U.FL Connector Drawing and Specification

5. Integration Guideline

5.1. System Diagram

Note:
(1) Pin IRQ_WL and Logger are assigned as the SoP mode pins, the default SoP mode is "01", which is IRQ_WL pin being pulled down and Logger pin being pulled up by default;
(2) SWDIO and SWCLK is for RF testing using TI's SimpleLink Wi-Fi ToolBox, recommended to be exposed to the host board;
(3) COEX I/F is the coexistence interface. Contact BDE for software support;
(4) The two antennas ANT1 and ANT2 should be physically placed apart, at least one quarter to one wavelength which is 31.25mm to 125mm, and they should be oriented at least 45 degree to 145 degree to each other;
(5) Contact BDE for antenna diversity software support;
(6) For BDE-BW335XA1 which is with integrated PCB trace antenna, the external antenna is not needed.

Figure 16. High-Level System Block Diagram

5.2. Module Placement

The placement of the module in the base board is critical in your design. Improper placement can lead to poor antenna performance. BDE recommend following below practical placement to achieve acceptable antenna performance.

Any form of proximity to the metal or other material will change/degrade the antenna performance. Keep the antenna area as far as possible to the metal material in any direction. If metal materials cannot be avoided in your design for example the

design with metal enclosure, we recommended keep the antenna area at least 40mm distance to the enclosure in all directions. Customers should verify the communication range with the mock-up or real product prototype on their own.

Place the module with the antenna pointing to the edge of the base board

Keep antenna area copper-free in all layers, e.g., no trace, ground pour, components, ect. Keep at least 15mm extended copper-free zone to the left and right, if there are components or routings nearby.

HVIN:BDE-BW3351A1

ANT1

Ground pour is allowed but try to avoid routing signal lines underneath this area

HVIN:BDE-BW3351U1

Place the antennas facing the edge of the PCB. Keep antenna area copper-free in all layers, e.g., no trace, ground pour, components, ect. Keep at least 15mm extended copper-free zone to the left and right, if there are components or routings nearby.

50-ohm impedance control for transmission line – coplanar waveguide line type, shield them with ground pour and stich multiple vias alongside the lines

ANT1

Reserve a Pi matching circuit near the antennas

HVIN:BDE-BW3351N1

Note:
(1) For integrated PCB trace antenna variant, the best practice is to place the module to the left corner of the PCB, however, placing the module to the middle or right corner could have acceptable performance.

Figure 17. Recommended Module Placement

5.3. Reference Design

For reference schematic and layout, please refer to the design files of BDE-33N-EM and BDE-33A-EM.

5.4. Other Design Considerations

Table 25. Other Design Considerations

	Thermal
1	The proximity of ground vias must be close to each ground pad of the module.
2	Signal traces must not be run underneath the module on the layer where the module is mounted.
3	Have a complete ground pour in layer 2 for thermal dissipation.
4	Have a solid ground plane and ground vias under the module for stable system and thermal dissipation.
5	Increase the ground pour in the first layer and have all of the traces from the first layer on the inner layers, if possible.
6	Signal traces can be run on a third layer under the solid ground layer, which is below the module mounting layer.
	RF Trace and Antenna Routing
7	The RF trace antenna feed must be as short as possible beyond the ground reference. At this point, the trace starts to radiate.
8	The RF trace bends must be gradual with an approximate maximum bend of 45° with trace mitered. RF traces must not have sharp corners.
9	RF traces must have via stitching on the ground plane beside the RF trace on both sides.
10	RF traces must have constant impedance (50-ohm Coplanar or microstrip transmission line).
11	For best results, the RF trace ground layer must be the ground layer immediately below the RF trace. The ground layer must be solid.
12	There must be no traces or ground under the antenna section.
13	RF traces must be as short as possible. The antenna, RF traces, and modules must be on the edge of the PCB product. The proximity of the antenna to the enclosure and the enclosure material must also be considered.
14	BDE recommends using double-shielded coaxial RF cable to connect with the U.FL connector with antenna if the U.FL variants are selected.
15	Do not place or run the RF cable right above or below the module.
16	If there are some other radios besides this module in the system, try to place them apart as far as possible. And ensure there is at least 25 dB isolation between the antenna port of every radio.
	Supply and Interface
17	The power trace for VDD_3V3 must be at least 40-mil wide.
18	The VDD_1V8 trace must be at least 18-mil wide.
19	Make VDD_3V3 and VDD_1V8 traces as wide as possible to ensure reduced inductance and trace resistance.
20	If possible, shield 3V3 and 1V8 traces with ground above, below, and beside the traces.
21	SDIO signals traces (CLK, CMD, D0, D1, D2, and D3) must be routed in parallel to each other and as short as possible (less than 12 cm). In addition, every trace length must be the same as the others. There should be enough space between traces- greater than 1.5 times the trace width or ground- to ensure signal quality, especially for the SDIO_CLK trace. Remember to keep these traces away from the other digital or analog signal traces. It is recommended adding ground shielding around these buses.
22	SDIO and digital clock signals are a source of noise. Keep the traces of these signals as short as possible. If possible, maintain a clearance around them.

6. Certification

6.1. Bluetooth Qualification

6.1.1. Bluetooth Qualification Information

The module series is listed on the Bluetooth SIG website as a qualified End Product, referencing a Controller and Host Subsystem combination. The detail information can be found in below table.

Table 26. Bluetooth Qualification Information

Declaration ID	Reference QDID	
D067335	Controller Subsystem	229129
	Host Subsystem	TBD

6.1.2. Bluetooth Qualification Process

Below Bluetooth qualification process is provided for customers when they are listing their end product referencing BDE module.
(1) Go to https://launchstudio.bluetooth.com/ and log in;
(2) Select **Start the Bluetooth Qualification Process with No Required Testing**;
(3) Project Basics:
    (a) Enter your project name, it can be the product name or the product series name;
    (b) Enter QDID that the product reference, in this case the QDID is 229129 for controller subsystem and .TBD for host subsystem.
(4) Product Declaration:
    (a) Select the listing date. You can select a date that you want your product listed and go public, although the qualification will complete immediately after your submission.
    (b) Add every product that integrated with this module. You can add a series of individual product models that use the same design/module without any modification.
(5) Declaration ID:
    (a) Select a DID. If you don't have one, you need to purchase a DID for your product by clicking Pay Declaration Fee.
(6) Review and Submit:
    (a) Review all information that you have entered and make sure no mistakes;
    (b) Tick all check boxes if you confirmed above information and add your name to the signature page;
    (c) Click **Signature Confirmed – Complete Project & Submit Product(s) for Qualification**.
(7) The qualification will be done immediately and your product will be listed to the Bluetooth SIG website as per your required listed date in step (4).

For more information about listing your product to Bluetooth SIG, please visit below webpage:
https://www.bluetooth.com/develop-with-bluetooth/qualification-listing/

6.2. Regulatory Compliance

The module is certified for FCC, IC/ISED and ETSI/CE as listed in below table. More regions can be cover by request.

Table 27. Certification Information

Regulatory Body / Region	ID	MPN
FCC (USA)	2ABRU-BW335S	BDE-BW3351N1
		BDE-BW3351U1
IC/ISED (Canada)	25657-BW335S	BDE-BW3351A1
TELEC (Japan)	XXX-XXXXXX	BDE-BW3350N1
		BDE-BW3350U1
		BDE-BW3350A1
		BDE-BW3351N1-IN
		BDE-BW3351U1-IN
ETSI/CE (Europe)	NA	BDE-BW3351A1-IN
		BDE-BW3350N1-IN
		BDE-BW3350U1-IN
		BDE-BW3350A1-IN

6.2.1. Certified Antennas

The module series has been tested and certified with three antennas, where BDE-BW335XA1 variants utilize an integrated PCB trace antenna and BDE-BW335XU1 variants utilize an external whip antenna through U.FL connector and BDE-BW335XN1 utilize a ceramic chip antenna utilized in the EM board through the dedicated ANT pin of the module.

The characteristic of the three antennas is listed in below table.

Table 28. Certified Antenna List

Antenna Type	Manufacturer	MPN	Frequency Range (MHz)	Note
Chip antenna	Ethertronics	M830520	2400 – 2500; 5150 – 5850	External
PCB trace antenna	BDE	BDE-ANT-BW33A	2400 – 2500; 5150 – 5850	Internal

Antenna Type	Manufacturer	MPN	Frequency Range (MHz)	Note
FPC antenna	BDE	BDE-FPC25-4017-120F1	2400 – 2500; 5150 – 5850	External
Whip antenna	BDE	BDE-W25-17010-HRP	2400 – 2500; 5150 – 5850	External

Customers are encouraged to use the certified antennas in the case of external antenna options to reduce certification testing effort and risk of failing. If customer want to choose another antenna that fits their product, there are some scenarios that need to be considered.

If the external antenna is of the same antenna type and of equal or less gain compared to the ones listed in above table, and with similar in-band and out-of-band characteristic, then the antenna can be used with the module in USA and Canada where modular approval is applicable, as long as the spot-check testing of the new antenna with host is performed to verified that it will not change the performance. However, in countries such as EU countries applying the ETSI standards where the modular approval is not applicable, the radiated emissions are always tested with the end product with any antennas.

If the external antenna is of a different type or with non-similar in-band and out-of-band characteristic, but still has equal gain or less gain compared to the above listed antennas. The new antenna can be added to the existing modular grant/certificate by filing a permissive change, C2PC (Class II Permissive Change) in case of FCC and ISED. The radiated emission testing is needed, but re-certification is not required.

In the case of the external antenna with higher gain than the peak gain listed in above table are very likely to require a full new end product certification. However, we recommended that you consult with your certification house to understand the correct approaches for your product case by case.

For the case where customer choose the certified antenna with BDE-BW335XNX through the dedicated ANT pin of the module, the customer must copy the design exactly as the one that tested in the certification to comply with the requirement.

6.2.2. FCC Caution

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, pursua nt to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful inte rference in a residential installation. This equipment generates uses and can radiate radio frequency energy a nd, if not installed and used in accordance with the instructions, may cause harmful interference to radio com munications. 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 turn ing 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: 2ABRU-BW335S "

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 manufacturers according to KDB 996369 D03 OEM Manual v01r01

2.2List of applicable FCC rules

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

2.3Specific 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.

2.4Limited module procedures

Not applicable

2.5Trace antenna designs

Not applicable

2.6RF 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.

2.7 Antennas

This radio transmitter **FCC ID:2ABRU-BW335S** has been approved by Federal Communications Commission to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

Antenna No.	Model No. of antenna:	Type of antenna:	Gain of the antenna (Max.)	Frequency range(MHz)
PCB antenna	BDE-ANT-BW33A	Internal	1.88dBi	5150 – 5850
Whip antenna	BDE-W25-17010-HRP	External	2.3dBi	5150 – 5850
FPC antenna	BDE-FPC25-4017-120F1	External	2.9dBi	5150 – 5850
Ceramic chip antenna	M830520	External	2.6dBi	5150 – 5850

2.8 Label and compliance information

The final end product must be labeled in a visible area with the following" Contains **FCC ID:2ABRU-BW335S**".

2.9 Information on test modes and additional testing requirements

Host manufacturer is strongly recommended to confirm compliance with FCC requirements for the transmitter when the module is installed in the host.

2.10 Additional testing, Part 15 Subpart B disclaimer

Host manufacturer is responsible for compliance of the host system with module installed with all other applicable requirements for the system such as Part 15 B.

2.11 Note EMI Considerations

Host manufacture is recommended to use D04 Module Integration Guide recommending as "best practice" RF design engineering testing and evaluation in case non-linear interactions generate additional non-compliant limits due to module placement to host components or properties.

2.12 How to make changes

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. According to the KDB 996369 D02 Q&A Q12, that a host manufacture only needs to do an evaluation (i.e., no C2PC required when no emission exceeds the limit of any individual device (including unintentional radiators) as a composite. The host manufacturer must fix any failure.

6.2.3. ISED Statement

-English: This device complies with Industry Canada license－exempt RSS standard(s). Operation is subject to the following two conditions: (1) This device may not cause interference, a nd (2) This device must accept any interference, including interference that may cause undesired operation of the device.
The digital apparatus complies with Canadian CAN ICES－3 (B)/NMB－3(B).
－French: Le présentappareilestconforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitationestautorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareildoit accepter tout brouillageradi oélectriquesubi, mêmesi le brouillageest susceptible d'encompromettre le fonctionnement.
l'appareil numérique du ciem conforme canadien peut －3 (b) / nmb －3 (b).

This device meets the exemption from the routine evaluation limits in section 6.3 of RSS 102 and compliance with RSS 102 RF exposure, users can obtain Canadian information on RF exposure and compliance.

cet appareil est conforme à l'exemption des limites d'évaluation courante dans la section 6.3 du cnr - 102 et conformité avec rss 102 de l'exposition aux rf, les utilisateurs peuvent obtenir des données canadiennes sur l'exposition aux champs rf et la conformité.

This equipment complies with Canada radiation exposure limits set forth for an uncontrolled environment.
Cet équipement est conforme Canada limites d'exposition aux radiations dans un environnement non contrôlé.

This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.
Cet équipementdoit être installé et utilisé à une distance minimale de 20 cm entre le radiateur et votre corps.

ISED Modular Usage Statement
NOTE 1: When the ISED certification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use the
wording ＂Contains transmitter module **IC: 25657-BW335S**＂ or ＂Contains **IC: 25657-BW335S**＂.

NOTE 1: Lorsque le numéro de certification ISED n'est pas visible lorsque le module est installé dans un autre appareil, l'ext érieur de l'appareil dans lequel le module est installé doit également afficher une étiquette faisant référence au module inclus. Cette étiquetteextérieure peut être libellée Contient le module émetteur IC: 25657-BW335S ou Contient **IC: 25657-BW335S.**
Device operating in the 5150-5250 MHz band under RSS-247 must include a user manual indicates the device is for indoor use only

7. Ordering Information

Table 29. Ordering Information

Orderable Part Number	Description	Size (mm)	Shipping Form	MOQ
BDE-BW3351N1	Wi-Fi 6 2.4-GHz & 5-GHz SISO & BLE 5.4, Single Antenna Port with ANT Pin, -40 °C to +85 °C	11 x 11 x 2	Tape & Reel	1K
BDE-BW3351U1	Wi-Fi 6 2.4-GHz & 5-GHz SISO & BLE 5.4, Single Antenna Port with U.FL Connector, -40 °C to +85 °C	11 x 15 x 2	Tape & Reel	1K
BDE-BW3351A1	Wi-Fi 6 2.4-GHz & 5-GHz SISO & BLE 5.4, Single Antenna Port with PCB trace antenna, -40 °C to +85 °C	11 x 15 x 2	Tape & Reel	1K
BDE-BW3350N1	Wi-Fi 6 2.4-GHz & 5-GHz SISO & BLE 5.4, Single Antenna Port with ANT Pin, -40 °C to +85 °C	11 x 11 x 2	Tape & Reel	1K
BDE-BW3350U1	Wi-Fi 6 2.4-GHz & 5-GHz SISO & BLE 5.4, Single Antenna Port with U.FL Connector, -40 °C to +85 °C	11 x 15 x 2	Tape & Reel	1K
BDE-BW3350A1	Wi-Fi 6 2.4-GHz & 5-GHz SISO & BLE 5.4, Single Antenna Port with PCB trace antenna, -40 °C to +85 °C	11 x 15 x 2	Tape & Reel	1K
BDE-BW3351N1-IN	Wi-Fi 6 2.4-GHz & 5-GHz SISO & BLE 5.4, Single Antenna Port with ANT Pin, -40 °C to +105 °C	11 x 11 x 2	Tape & Reel	1K
BDE-BW3351U1-IN	Wi-Fi 6 2.4-GHz & 5-GHz SISO & BLE 5.4, Single Antenna Port with U.FL Connector, -40 °C to +105 °C	11 x 15 x 2	Tape & Reel	1K
BDE-BW3351A1-IN	Wi-Fi 6 2.4-GHz & 5-GHz SISO & BLE 5.4, Single Antenna Port with PCB trace antenna, -40 °C to +105 °C	11 x 15 x 2	Tape & Reel	1K
BDE-BW3350N1-IN	Wi-Fi 6 2.4-GHz & 5-GHz SISO & BLE 5.4, Single Antenna Port with ANT Pin, -40 °C to +105 °C	11 x 11 x 2	Tape & Reel	1K
BDE-BW3350U1-IN	Wi-Fi 6 2.4-GHz & 5-GHz SISO & BLE 5.4, Single Antenna Port with U.FL Connector, -40 °C to +105 °C	11 x 15 x 2	Tape & Reel	1K
BDE-BW3350A1-IN	Wi-Fi 6 2.4-GHz & 5-GHz SISO & BLE 5.4, Single Antenna Port with PCB trace antenna, -40 °C to +105 °C	11 x 15 x 2	Tape & Reel	1K

8. Revision History

Table 30. Revision History

Revision	Date	Description
V0.1	16-Dec-2022	Preliminary, draft
V0.2	13-Feb-2023	Updated pinout, added reference design
V0.3	29-Mar-2023	Added more information
V0.4	14-Jul-2023	Corrected some editorial mistakes, updated reference design
V0.5	30-Jan-2024	Added detailed information
V0.6	20-Mar-2024	Updated some data, corrected some mistakes

Note:

The latest datasheet can be found with this [Link](#).

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