General Description

BDE-BW3300XX is a 2.4-GHz Wi-Fi 6 wireless module based on TI's 10th generation connectivity companion chip CC3300 which is based upon proven technology and complements the TI integrated devices for connectivity portfolio. This module 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-BW3300XX 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.

In order to fulfil different integration requirements, BDE provides different options including:

- BDE-BW3300N1, single antenna port without antenna;
- BDE-BW3300U1, single antenna port with U.FL connector;
- BDE-BW3300A1, single antenna with integrated PCB trace antenna.

Key Features

- Highly optimized Wi-Fi 6 system for low cost embedded IoT applications
- Seamless integration with TI Sitara MPU (Linux) / MCU+ (FreeRTOS) as well as other application processors
- 3-wire or 1-wire PTA for external coexistence with additional 2.4GHz radios (e.g. Thread or Zigbee)
- Multirole support e.g. STA and AP to connect directly with other Wi-Fi devices on different RF channels (Wi-Fi networks)
- Optional antenna diversity or selection
- Operating temperature: -40°C to +85°C
- Wi-Fi 6®
  - MAC, Baseband and RF Transceiver with support for IEEE 802.11 a/b/g/n/ax Wi-Fi6
  - Medium access controller (MAC)
- Hardware-based encryption and decryption using supporting WPA2 and WPA3
- TWT and OFDMA for optimal embedded performance
- Application throughput up to 50 Mbps
- Supports 4-bit SDIO and SPI host interfaces
- Integrated 2.4G-Hz PA for complete wireless solution with up to +20dBm output power
- Security
  - Secured host interface
  - Firmware authentication
  - Anti-rollback protection
- Power Management
  - VDD_1V8: 1.62V - 1.98 V
  - VDD_3V3: 2.1 V - 4.2 V
- Clock Source:
  - 40 MHz XTAL fast clock
  - External 32.768-kHz slow clock by default
- Package
  - 65-QFM, 11-mm x 11-mm x 2-mm
- Regulatory (In Progress)
  - FCC
  - IC
  - CE-RED

Applications

- Grid Infrastructure
  - Electricity Meter
  - String Inverter
  - Micro Inverter
  - Energy Storage Power Conversion System (PCS)
- 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 glucose monitor
  - Blood pressure monitor
  - CPAP machine
  - Telehealth systems
  - MRI
  - Ultrasound scanner
  - Ultrasound smart probe
  - Electric toothbrush
- Retail Automation and Payment

Contents

1. References

1. CC3300 resources: https://www.ti.com/product/CC3300

2. Block Diagram

BDE-BW3300XX module is based on the TI's 10th generation connectivity combo chip CC3300.
The module, as seen in Figure 2-1, comprises of:
- 40-MHz XTAL
- Bandpass filter
- Decoupling capacitors
- U.FL connector (in BDE-BW3300U1)
- PCB antenna (in BDE-BW3300A1)

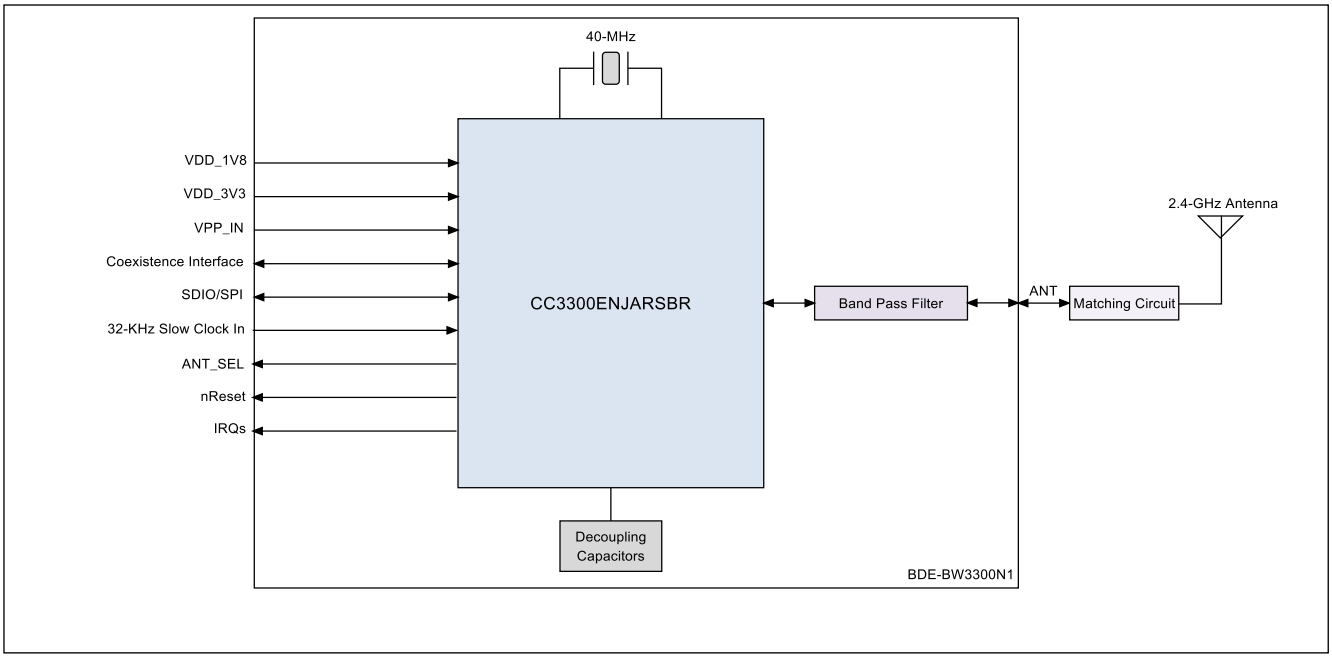

Figure 1. Block Diagram of BDE-BW3300N1

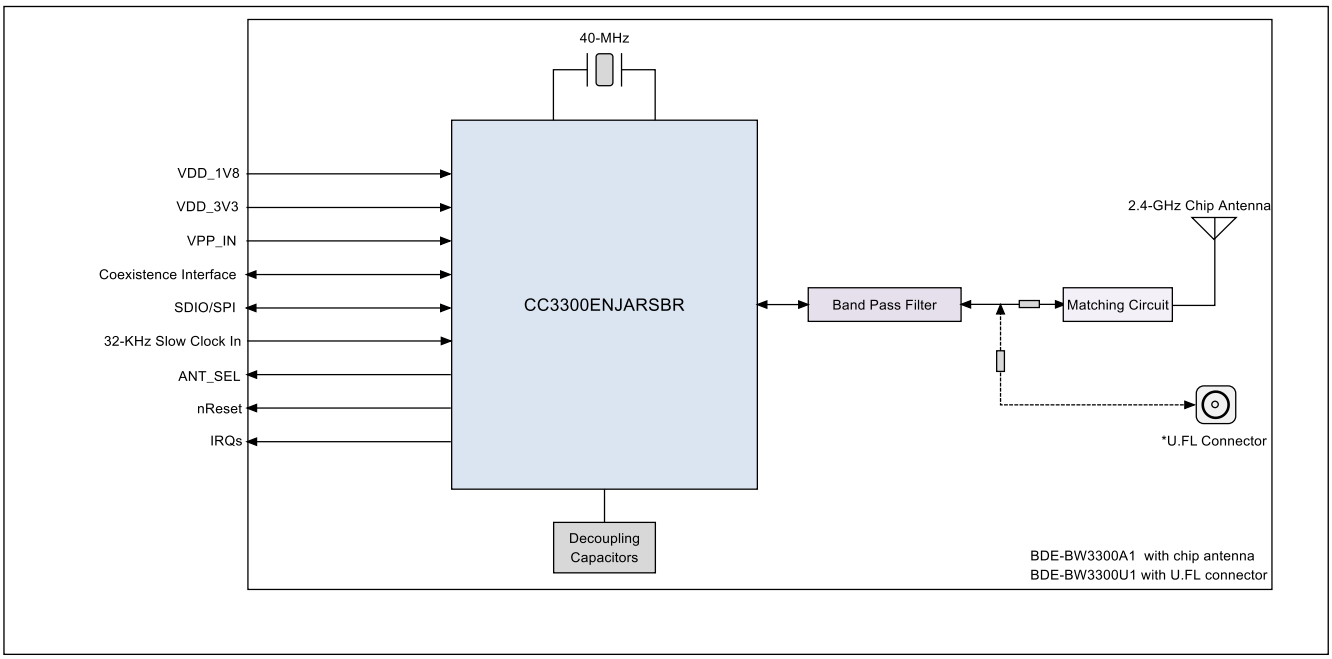

Figure 2. Block Diagram of BDE-BW3300A1/U1

3. Terminal Configuration and Functions

3.1 Pin Diagram

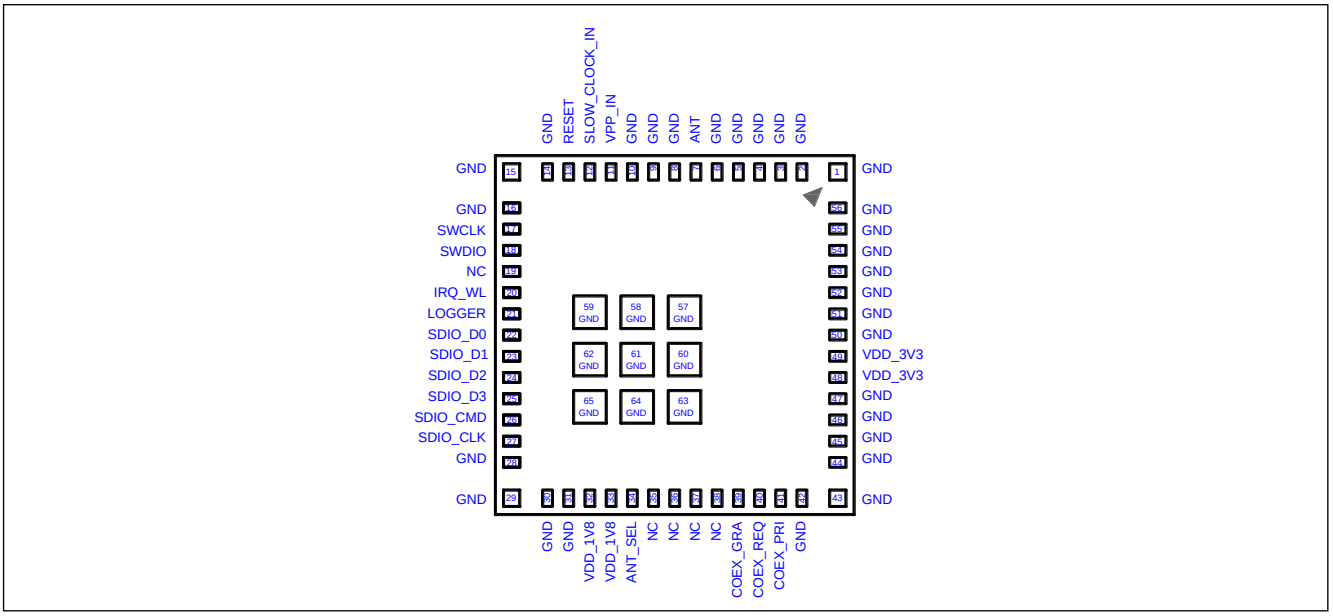

Figure 3. Pin Diagram of BDE-BW3300N1 (Bottom View)

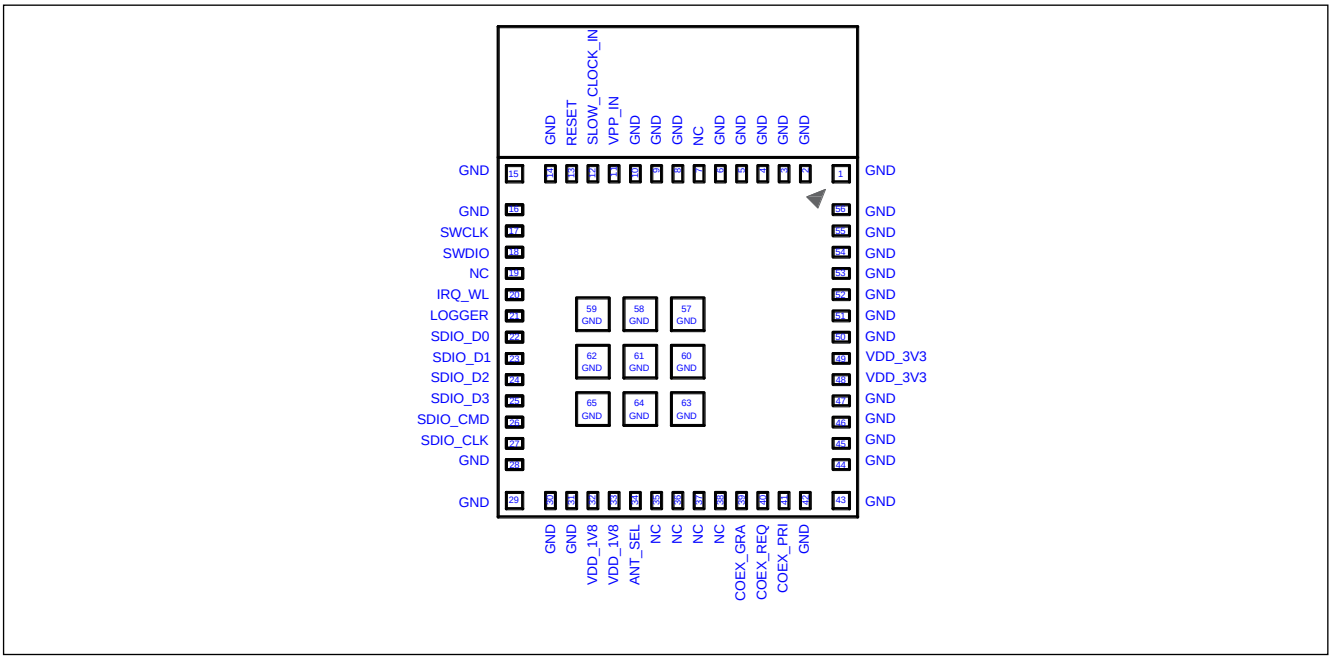

Figure 4. Pin Diagram of BDE-BW3300U1 and BDE-BW3300A1 (Bottom View)

3.2 Pin Attributes and Pin Multiplexing

Table 1. Pin 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	ANA	Bluetooth Low Energy and WLAN 2.4-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	NC	-	NC
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
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	NC	-	NC
36	NC	-	NC
37	NC	-	NC
38	NC	-	NC
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

Module Pin #	Pin Name	Type	Description
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

4. Specifications

4.1 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.

PARAMETER	MIN	MAX	UNIT	Notes
V_{DD_3V3}	TBD	TBD	V	
V_{PP}	TBD	TBD	V	
V_{DD_1V8}	TBD	TBD	V	VDD IO Voltage
ANT pin	TBD	TBD	dBm	
Storage Temperature	TBD	TBD	°C	

4.2 ESD Ratings

		VALUE	UNIT
V (ESD) Electrostatic discharge	Human-body model (HBM), per ANSI/ESDA/JEDEC JS-001[1]	TBD	V
	Charged device model (CDM), per ANSI/ESDA/JEDEC JS-002[2]	TBD	

(1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process.

(2) JEDEC document JEP157 states that 250-V CDM allows safe manufacturing with a standard ESD control process.

4.3 Recommended Operating Conditions

PARAMETER	MIN	TYP	MAX	UNIT	Notes
V_{DD_3V3}	2.1	3.3	4.2	V	
V_{DD_1V8}	1.62	1.8	1.98	V	
Storage Temperature	-40		85	°C	

5. Mechanical Specifications

5.1 Dimensions

Below figures show the overall dimensions of BDE-BW3300N1, BDE-BW3300U1 and BDE-BW3300A1.

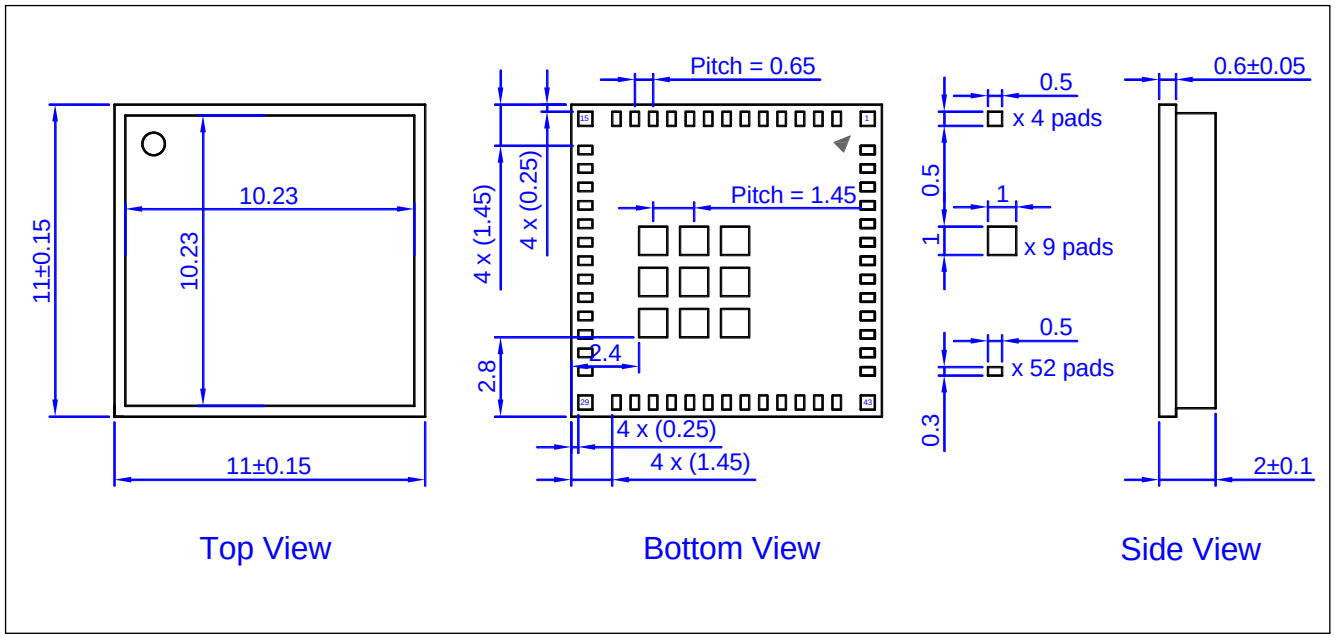

Figure 5. Mechanical Drawing of BDE-BW3300N1

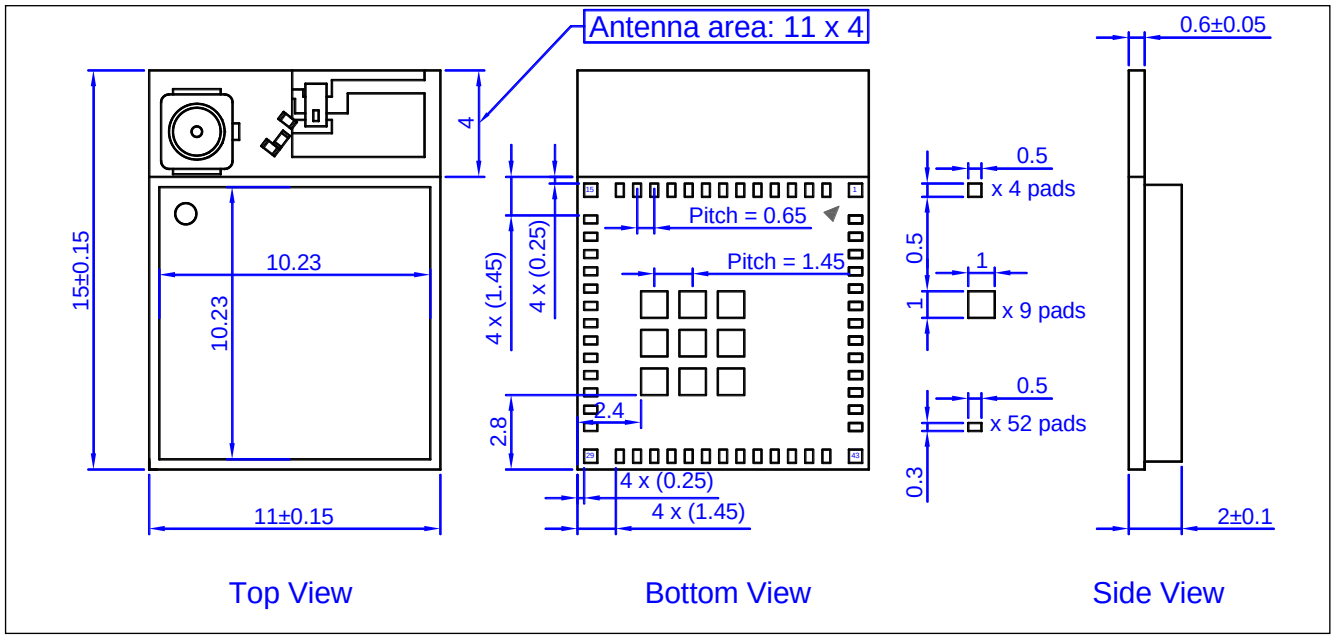

Figure 6. Mechanical Drawing of BDE-BW3300U1 and BDE-BW3300A1

6. Reference Design

6.1. Block Diagram

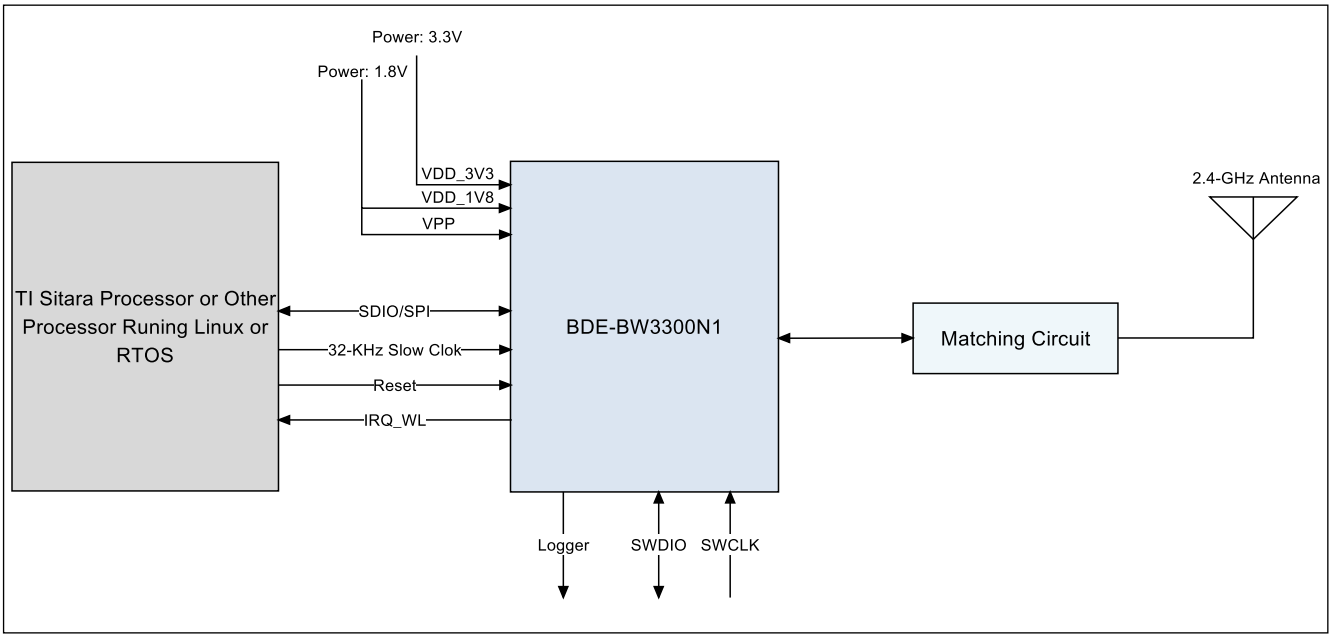

Figure 7. High-Level System Block Diagram

Note: 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.

6.2. Reference Schematic

For reference schematic, please refer to the design files of BDE-EVM-3300N.

6.3. Design Consideration

ITEM	DESCRIPTION
Thermal	
1	The proximity of ground vias must be close to the pad.
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 (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.
Supply and Interface	
14	The power trace for VBAT must be at least 40-mil wide.
15	The 1.8-V trace must be at least 18-mil wide.
16	Make VDD_3V3 and VDD_1V8 traces as wide as possible to ensure reduced inductance and trace resistance.
17	If possible, shield 3V3 and 1V8 traces with ground above, below, and beside the traces.
18	SDIO signals traces (CLK, CMD, DO, 01, 02, and 03) 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. BDE recommends adding ground shielding around these buses.
19	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.

7. Ordering Information

Part Number	Size (mm)	Core Chip	Shipping Form	MOQ
BDE-BW3300N1	11 x 11 x 2	CC3300	Tape & Reel	1K
BDE-BW3300U1	11 x 15 x 2	CC3300	Tape & Reel	1K
BDE-BW3300A1	11 x 15 x 2	CC3300	Tape & Reel	1K

8. Revision History

Revision	Date	Description
V0.1	17-Oct-2022	Preliminary, draft
V0.2	16-Nov-2022	Preliminary, changed part number, updated diagram, pinout, mechanical
V0.3	8-Dec-2022	Preliminary, updated product image, diagram, mechanical
V0.4	31-Mar-2023	Modified pinout and dimension, added more information including reference and design considerations
V0.5	22-Sep-2023	Changed part number, add new parts, modified block diagram, modified mechanical drawings

The latest datasheet can be found in this link.

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