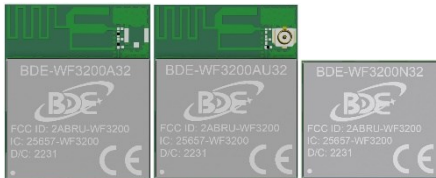


## General Description



BDE-WF3200 is a Wi-Fi® module series consisting of CC3200R1M2RGC single-chip wireless microcontroller (MCU). This series provides three options: BDE-WF3200A32 (Integrated PCB antenna version), BDE-WF3200AU32 (U.FL connector version) and BDE-WF3200N32 (No antenna version). Customer can choose the suitable version for different application scenario.

Created for the IoT, the BDE-WF3200 is a wireless MCU module that integrates an Arm® Cortex®-M4 MCU, allowing customers to develop an entire application with one device. With on-chip Wi-Fi, Internet, and robust security protocols, no prior Wi-Fi experience is required for faster development. The BDE-WF3200 integrates all required system-level hardware components including clocks, SPI Flash, and passives into a QFM package for easy assembly and low-cost PCB design.

The applications MCU subsystem contains an industry-standard Arm® Cortex®-M4 core running at 80 MHz. The device includes a wide variety of peripherals, including a fast parallel camera interface, I2S, SD/MMC, UART, SPI, I2C, and four-channel ADC. The CC3200 family includes flexible embedded RAM for code and data; ROM with external serial Flash bootloader and peripheral drivers; and SPI Flash for Wi-Fi network processor service packs, Wi-Fi certificates, and credentials.

The Wi-Fi network processor subsystem features a Wi-Fi Internet-on-a chip™ and contains an additional dedicated Arm® MCU that completely off-loads the applications MCU. This subsystem includes an 802.11 b/g/n radio, baseband, and MAC with a powerful crypto engine for fast, secure Internet connections with 256-bit encryption. The BDE-WF3200 supports station, access point, and Wi-Fi Direct modes. The device also supports WPA2 personal and enterprise security and WPS 2.0. The Wi-Fi Internet-on-a-chip includes embedded TCP/IP and TLS/SSL stacks, HTTP server, and multiple Internet protocols. The power-management subsystem includes integrated DC/DC converters supporting a wide range of supply voltages. This subsystem enables low-power consumption modes, such as the hibernate with RTC mode requiring less than 7  $\mu$ A of current.

## Key Features

- BDE-WF3200 is a Wi-Fi module consisting of CC3200R1M2RGC single-chip wireless microcontroller (MCU)
- Fully integrated module includes all required clocks, SPI Flash, and passives
- Modular FCC, IC, and CE certifications save customer effort, time, and money
- 1.27-mm pitch QFM package for easy assembly and low-cost PCB design
- Applications MCU subsystem:
  - Arm® Cortex®-M4 core at 80 MHz
  - Embedded memory:
    - ✧ Integrated serial 32Mbit Flash
    - ✧ RAM (up to 256KB)

- ◇ Peripheral drivers in ROM
- Hardware crypto engine for advanced hardware security including:
  - ◇ AES, DES, and 3DES
  - ◇ SHA and MD5
  - ◇ CRC and Checksum
- 8-Bit parallel camera
- One Multichannel Audio Serial Port (McASP) interface with support for I2S format
- One SD (MMC) interface
- 32-channel Micro Direct Memory Access (μDMA)
- Two Universal Asynchronous Receivers and Transmitters (UARTs)
- Two Serial Peripheral Interfaces (SPIs)
- One Inter-integrated Circuit (I2C)
- Four General-Purpose Timers (GPTs)
- 16-Bit Pulse-Width Modulation (PWM) mode
- One Watchdog Timer Module
- 4-channel, 12-bit Analog-to-Digital Converters (ADCs)
- Up to 25 individually programmable GPIO pins
- Wi-Fi network processor subsystem:
  - 802.11 b/g/n radio, baseband, and medium access control
  - TCP/IP Stack
  - Eight simultaneous TCP, UDP, or RAW sockets
  - Two simultaneous TLS v1.2 or SSL 3.0 sockets
- ARP, ICMP, DHCP, DNS, and mDNS support
- HTTP server with built-in programmable HTML page for over-the-network device configuration
- Powerful crypto engine for fast, secured WLAN connections with 256-bit encryption
- Station, Access Point, and Wi-Fi Direct® Modes
- WPA2 personal and enterprise security
- SimpleLink™ connection manager for managing Wi-Fi security states
- TX power:
  - 17 dBm at 1 DSSS
  - 17 dBm at 11 CCK
  - 13 dBm at 54 OFDM
- RX sensitivity:
  - -94 dBm at 1 DSSS
  - -87 dBm at 11 CCK
  - -73 dBm at 54 OFDM
- Application Throughput:
  - UDP: 16 Mbps
  - TCP: 13 Mbps
- Power-management subsystem:
  - Integrated DC/DC converter with a wide-supply voltage:
    - ◇ VBAT: 2.3 to 3.6 V
- Low-power consumption at 3.6 V:
  - Hibernate with Real-Time Clock (RTC): 7 μA
  - Low-Power Deep Sleep: <275 μA
  - RX Traffic: 59 mA at 54 OFDM
  - TX Traffic: 229 mA at 54 OFDM
- Package and operating conditions:
  - 1.27-mm pitch, 63-Pin, 20.5-mm × 25-mm (BDE-WF3200A32/BDE-WF3200AU32) and 20.5-mm × 17.5-mm (BDE-WF3200N32) QFM package for easy assembly and low-cost PCB design
  - Operating temperature range: -20°C to +70°C
- Additional integrated components:
  - 40.0-MHz crystal
  - 32.768-kHz crystal (RTC)
  - 32-Mbit SPI Serial Flash
  - RF filter and passive components
- Antenna:
  - BDE-WF3200A32: Integrated PCB antenna
  - BDE-WF3200AU32: U.FL connector for connecting external antenna
  - BDE-WF3200N32: No antenna included, RF pad for connecting external antenna

## Applications

- Internet-of-Things (IoT)
- Home appliances
- Building automation
- Security systems
- Smart energy
- Internet Gateway
- Industrial control
- Smart Plug and Metering
- Wireless communications
- Wearables

## Device Family

**Table 0-1. BDE-WF3200 Device Family**

| Part Number    | Core Chip                     | Description   | Size (mm)         | Package |
|----------------|-------------------------------|---|-------------------|---------|
| BDE-WF3200A32  | <a href="#">CC3200R1M2RGC</a> | With 32Mbit SPI flash, with integrated PCB antenna                      | 20.5 × 25 × 2.4   | SMD-63  |
| BDE-WF3200AU32 | <a href="#">CC3200R1M2RGC</a> | With 32Mbit SPI flash, with U.FL connector for external antenna         | 20.5 × 25 × 2.4   | SMD-63  |
| BDE-WF3200N32  | <a href="#">CC3200R1M2RGC</a> | With 32Mbit SPI flash, without antenna, RF pad out for external antenna | 20.5 × 17.5 × 2.4 | SMD-63  |

## Reference

[1] CC3200 resources: <https://www.ti.com/product/CC3200>

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# 1. Block Diagram

BDE-WF300 module is based on the TI Instruments CC3200R1M2RGC single chip wireless MCU. With an integrated 32Mbit SPI flash, clocks, other required passives and antenna/connector (optional), it allows faster time to market at reduced development cost.

The module, as seen in Figure 1-1, comprises of:

- 32 Mbit SPI Flash
- 40-MHz XTAL
- 32.768-kHz XTAL
- Filter
- PCB trace antenna / U.FL connector for external antenna / RF pad for external antenna

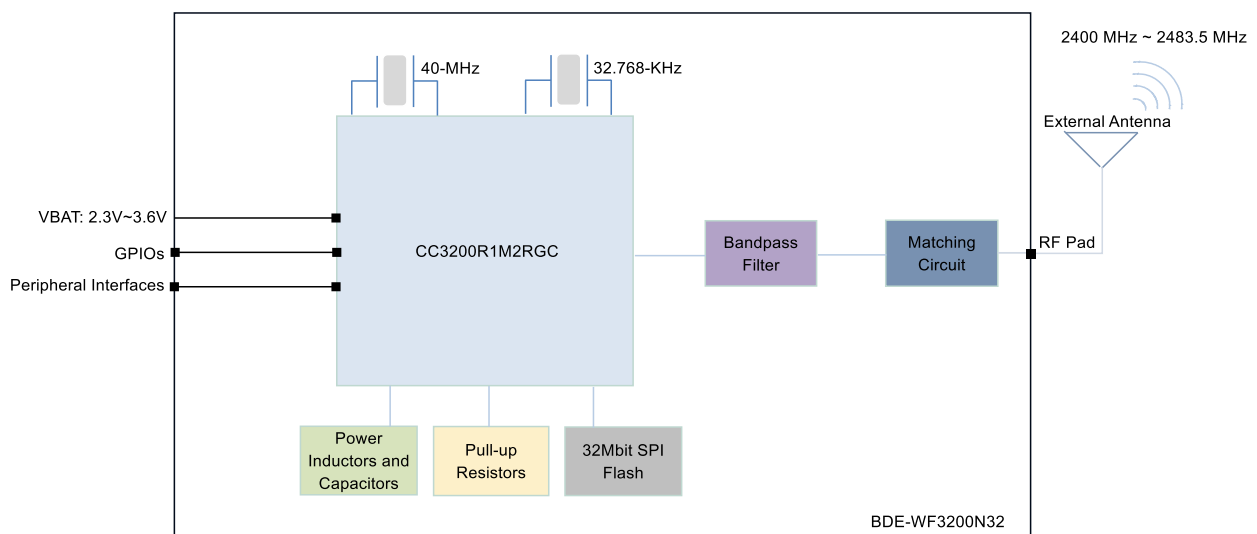
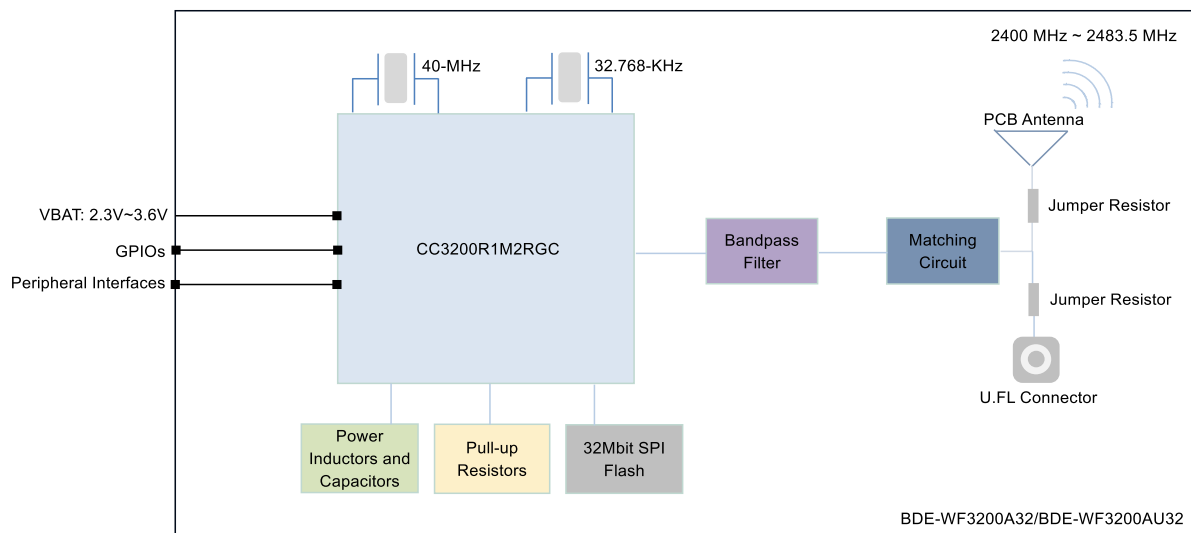


Figure 1-1. The block diagram of BDE-WF3200

## 2. Pinout

### 2.1. Pinout Diagram

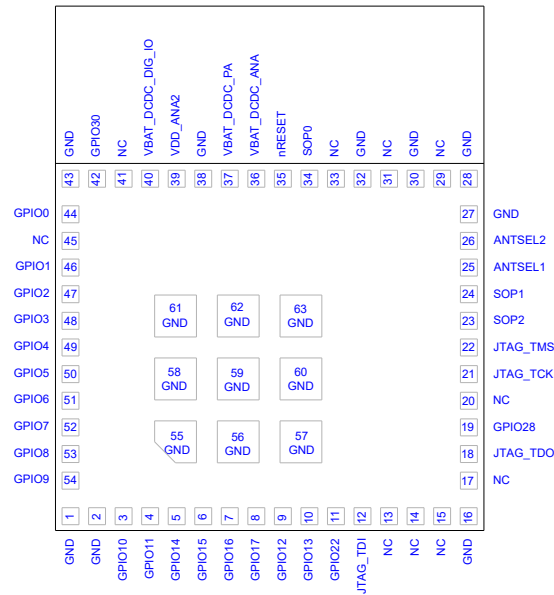


Figure 2-1. Pinout Diagram of BDE-WF3200A32/BDE-WF3200AU32 Top View

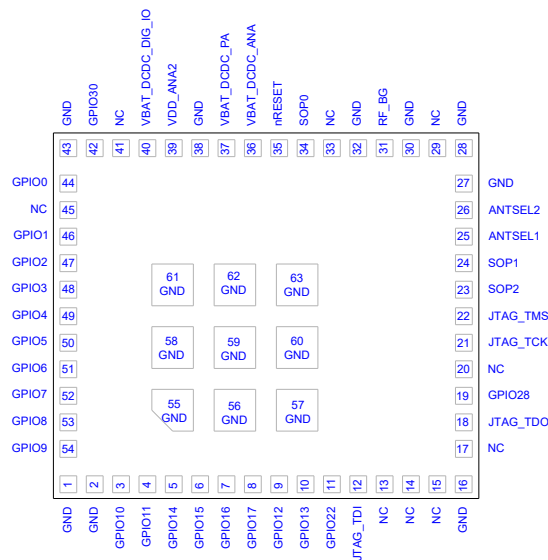


Figure 2-2. Pinout Diagram of BDE-WF3200N32 Top View

## 2.2. Pinout Discription

Table 2-1 describes the definitions of the pins of the module. Pin number of CC3200 chip is also stated here, because the VQFN pin is referred to in the software design kit (SDK).

**Table 2-1. Pin Description**

| Module Pin # | Pin Name | Type  | CC3200 Pin # | Description  |
|--------------|----------|-------|--------------|--|
| 1            | GND      | -     | -            | Ground   |
| 2            | GND      | -     | -            | Ground   |
| 3            | GPIO10   | I/O   | 1            | GPIO <sup>(1)</sup>  |
| 4            | GPIO11   | I/O   | 2            | GPIO <sup>(1)</sup>  |
| 5            | GPIO14   | I/O   | 5            | GPIO <sup>(1)</sup>  |
| 6            | GPIO15   | I/O   | 6            | GPIO <sup>(1)</sup>  |
| 7            | GPIO16   | I/O   | 7            | GPIO <sup>(1)</sup>  |
| 8            | GPIO17   | I/O   | 8            | GPIO <sup>(1)</sup>  |
| 9            | GPIO12   | I/O   | 3            | GPIO <sup>(1)</sup>  |
| 10           | GPIO13   | I/O   | 4            | GPIO <sup>(1)</sup>  |
| 11           | GPIO22   | I/O   | 15           | GPIO <sup>(1)</sup>  |
| 12           | JTAG_TDI | I/O   | 16           | GPIO <sup>(1)</sup>  |
| 13           | NC       | -     | 13           | Reserved   |
| 14           | NC       | -     | 14           | Reserved   |
| 15           | NC       | -     | 11           | Reserved   |
| 16           | GND      | -     | -            | Ground   |
| 17           | NC       | -     | 12           | Reserved   |
| 18           | JTAG_TDO | I/O   | 17           | GPIO <sup>(1)</sup>  |
| 19           | GPIO28   | I/O   | 18           | GPIO <sup>(1)</sup>  |
| 20           | NC       | -     | 23           | Unused. Do not connect   |
| 21           | JTAG_TCK | I/O   | 19           | JTAG TCK input. Needs 100-kΩ pulldown resistor to ground. Not adding the 100K resistor can cause higher current in LPDS mode. <sup>(1)</sup>             |
| 22           | JTAG_TMS | I/O   | 20           | JTAG TMS input. Leave unconnected if not used on product. <sup>(1)</sup>   |
| 23           | SOP2     | -     | 21           | Add 2.7-kΩ pulldown resistor to ground needed for functional mode. Connect to test point to be pulled high for entering the UART load mode for flashing. |
| 24           | SOP1     | -     | 34           | Reserved. Do not connect.  |
| 25           | ANTSEL1  | I/O   | 29           | Antenna selection control <sup>(1)</sup>   |
| 26           | ANTSEL2  | I/O   | 30           | Antenna selection control <sup>(1)</sup>   |
| 27           | GND      | -     | -            | Ground   |
| 28           | GND      | -     | -            | Ground   |
| 29           | NC       | -     | 27, 28       | Reserved   |
| 30           | GND      | -     | -            | Ground   |
| 31           | NC/RF_BG | -/I/O | 31           | NC in BDE-WF3200A32 and BDE-WF3200AU32<br>2.4-GHz RF input/output in BDE-WF3200N32   |



| Module Pin #                             | Pin Name         | Type | CC3200 Pin # | Description  |
|--|------------------|------|--------------|--|
| 32                                       | GND              | -    | -            | Ground   |
| 33                                       | NC               | -    | 38           | Reserved   |
| 34                                       | SOP0             | -    | 35           | Optional 10-k $\Omega$ pullup if user chooses to use SWD debug mode instead of 4-wire JTAG |
| 35                                       | nRESET           | I    | 32           | Power on reset. Does not require external RC circuit                                       |
| 36                                       | VBAT_DCDC_ANA    | -    | 37           | Power supply for the device, can be connected to battery (2.3 V to 3.6 V)                  |
| 37                                       | VBAT_DCDC_PA     | -    | 39           | Power supply for the device, can be connected to battery (2.3 V to 3.6 V)                  |
| 38                                       | GND              | -    | -            | Ground   |
| 39                                       | NC               | -    | 47           | Leave unconnected  |
| 40                                       | VBAT_DCDC_DIG_IO | -    | 10, 44, 54   | Power supply for the device, can be connected to battery (2.3 V to 3.6 V)                  |
| 41                                       | NC               | -    | 25, 36, 48   | Reserved   |
| 42                                       | GPIO30           | I/O  | 53           | GPIO <sup>(1)</sup>  |
| 43                                       | GND              | -    | -            | Ground   |
| 44                                       | GPIO0            | I/O  | 50           | GPIO <sup>(1)</sup>  |
| 45                                       | NC               | -    | 51           | Reserved   |
| 46                                       | GPIO1            | I/O  | 55           | GPIO <sup>(1)</sup>  |
| 47                                       | GPIO2            | I/O  | 57           | GPIO <sup>(1)</sup>  |
| 48                                       | GPIO3            | I/O  | 58           | GPIO <sup>(1)</sup>  |
| 49                                       | GPIO4            | I/O  | 59           | GPIO <sup>(1)</sup>  |
| 50                                       | GPIO5            | I/O  | 60           | GPIO <sup>(1)</sup>  |
| 51                                       | GPIO6            | I/O  | 61           | GPIO <sup>(1)</sup>  |
| 52                                       | GPIO7            | I/O  | 62           | GPIO <sup>(1)</sup>  |
| 53                                       | GPIO8            | I/O  | 63           | GPIO <sup>(1)</sup>  |
| 54                                       | GPIO9            | I/O  | 64           | GPIO <sup>(1)</sup>  |
| 55, 56, 57, 58,<br>59, 60, 61, 62,<br>63 | GND              | -    | -            | Ground   |

Note <sup>(1)</sup>: For pin multiplexing details, refer to the [CC3200 SimpleLink™ Wi-Fi® Wireless and Internet-of-Things Solution, a Single-Chip Wireless](#)

## 3. Characteristics

### 3.1. 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 3-1. Absolute Maximum Ratings**

| PARAMETER                               | MIN  | MAX        | UNIT | Notes |
|---|------|------------|------|-------|
| VBAT and VIO                            | -0.5 | 3.8        | V    |       |
| Digital I/O                             | -0.5 | VBAT + 0.5 | V    |       |
| RF pin                                  | -0.5 | 2.1        | V    | RF_BG |
| Analog Pins                             | -0.5 | 2.1        | V    |       |
| Operating temperature (T <sub>A</sub> ) |      | 85         | °C   |       |
| Storage Temperature (T <sub>stg</sub> ) | -40  | 85         | °C   |       |

### 3.2. Recommended Operating Conditions

Over operating free-air temperature range (unless otherwise noted)<sup>(1)</sup>

**Table 3-2. Recommended Operating Conditions**

| PARAMETER                               | MIN | TYP | MAX | UNIT |
|---|-----|-----|-----|------|
| VBAT and VIO                            | 2.3 | 3.3 | 3.6 | V    |
| Operating temperature (T <sub>A</sub> ) | -20 | 25  | 70  | V    |

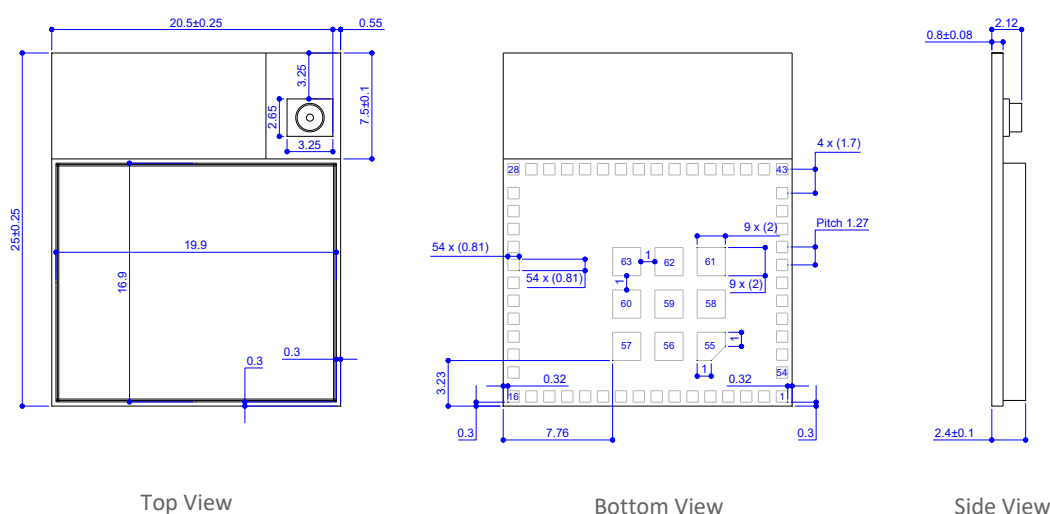
Note <sup>(1)</sup>: To ensure WLAN performance, the ripple on the power supply must be less than ±300 mV. The ripple should not cause the supply to fall below the brownout voltage.

## 4. Mechanical Specifications

The following pages include mechanical, footprint drawings, and marking information. This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document

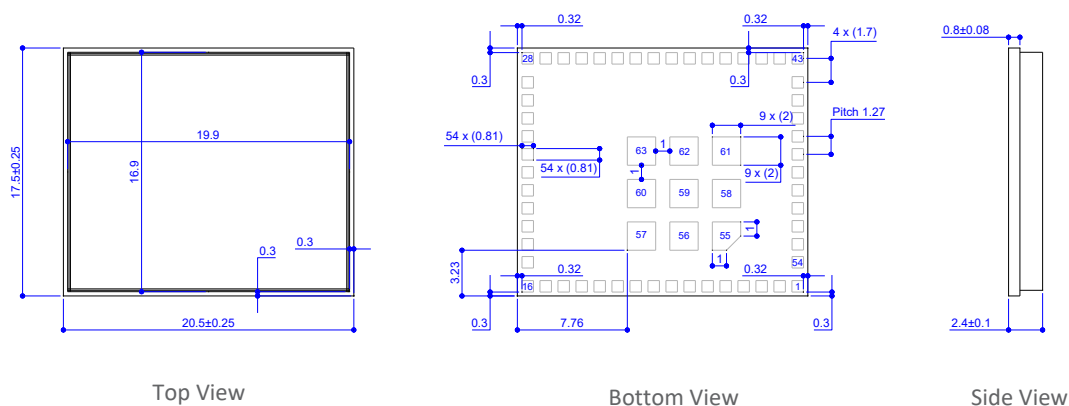
### 4.1. Dimensions

The module dimensions are presented in the following figure:



Note: All dimensions are in millimeter

Figure 4-1. Mechanical Drawing for BDE-WF3200A32/BDE-WF3200AU32

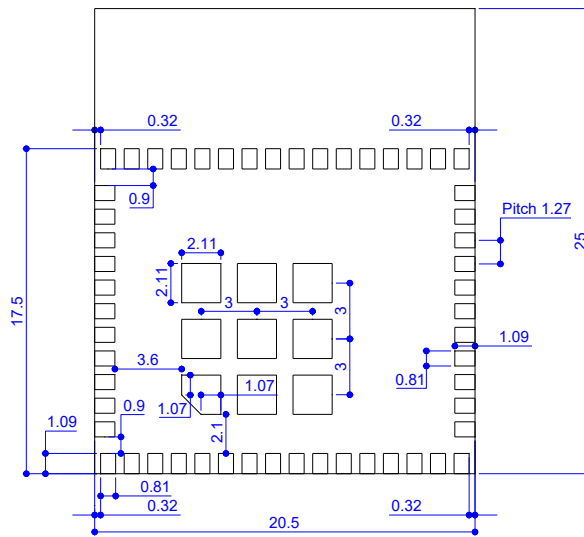


Note: All dimensions are in millimeter

Figure 4-2. Mechanical Drawing for BDE-WF3200N32

## 4.2. PCB Footprint

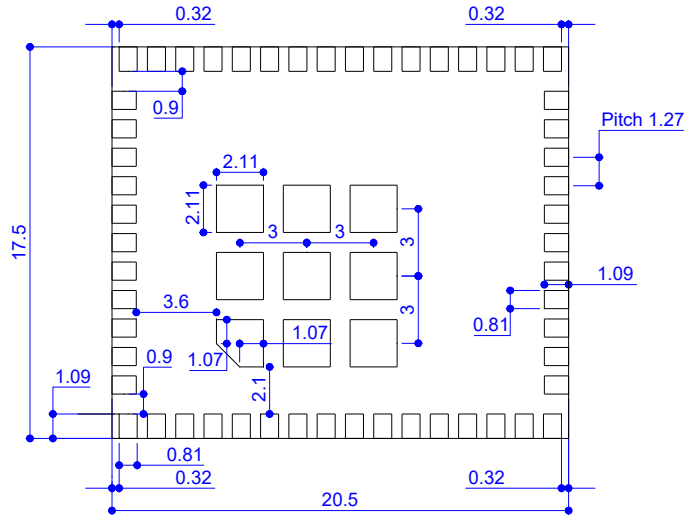
The footprint for the PCB is presented in the following figures:



Note:

1. All dimensions are in millimeter
2. Solder mask should be the same or 5% larger than the dimension of the pad
3. Solder paste must be the same as the pin for all peripheral pads. For ground pins, make the solder paste 20% smaller than the pad.

**Figure 4-3. Module Footprint for BDE-WF3200A32/BDE-WF3200AU32 Top View**

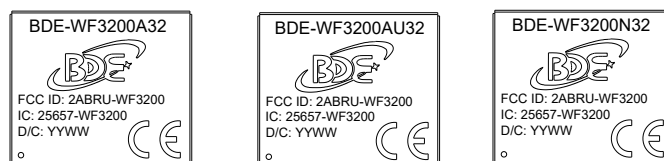


**Note:**

1. All dimensions are in millimeter
2. Solder mask should be the same or 5% larger than the dimension of the pad
3. Solder paste must be the same as the pin for all peripheral pads. For ground pins, make the solder paste 20% smaller than the pad.

**Figure 4-4. Module Footprint for BDE-WF3200N32 Top View**

## 5. Marking



**Figure 5-1. Module Marking**

## 6. Typical Reflow Profile

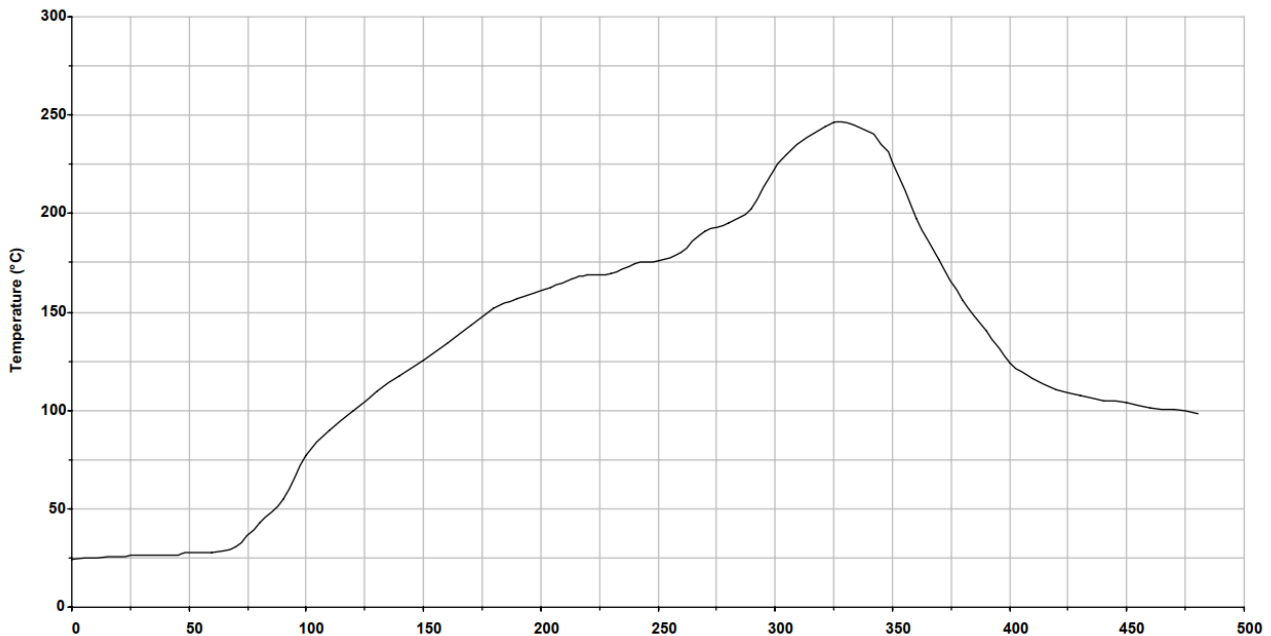


Figure 6-1. Typical Reflow Profile

Key features of the profile:

- Initial ramp = 1-2.5°C/sec to 175°C ±25°C equilibrium
- Equilibrium time = 60 to 180 seconds
- Ramp to maximum temperature (245°C) = 3°C/sec max.
- Time above liquidus temperature (217°C): 45-90 seconds
- Device absolute maximum reflow temperature: 260°C

## 7. Ordering Information

| Part Number    | Description   | Size (mm)         | Package     | MOQ |
|----------------|---|-------------------|-------------|-----|
| BDE-WF3200A32  | BDE Wi-Fi Module Based on CC3200, with Integrated PCB Antenna | 25 × 20.5 × 2.4   | Tape & Reel | 500 |
| BDE-WF3200AU32 | BDE Wi-Fi Module Based on CC3200, with U.FL Connector         | 25 × 20.5 × 2.4   | Tape & Reel | 500 |
| BDE-WF3200N32  | BDE Wi-Fi Module Based on CC3200, without Antenna             | 20.5 × 17.5 × 2.4 | Tape & Reel | 900 |

## 8. Revision History

| Revision | Date         | Description        |
|----------|--------------|--------------------|
| V0.1     | 26-July-2022 | Preliminary, draft |

## Contacts

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