# BDE-BLEM201P

## Bluetooth Low Energy Module

■ Size: 16.55mm x10.88mm x 1.5mm
(Without Shielding)
16.55mm x10.88mm x 2.2mm
(With Shielding)

## Descriptions

## Key Features

BDE-BLEM201P is a Bluetooth 4.0 single-mode compliant Bluetooth low energy module targeted at low power sensors and PC/Phone accessories.

- ■ Bluetooth 4.0 single-mode compliant
- ■ Support master and slave modes, 3+ simultaneous connections in master mode
- ■ Integrated Bluetooth Low Energy stack, no external MCU needed
- ■ RF performance
  - ➢ TX power: -23dBm to 0dBm
  - ➢ RX sensitivity: up to -94dBm
- ■ Communication range: 100m (LOS)
- ■ Ultra low power 8051 microcontroller core
  - ➢ 8K RAM with retention
  - ➢ 128K /256K in-system-programming flash
  - ➢ 23 GPIOs (21x4mA, 2x20mA)
  - ➢ 12-bit ADC with eight channels and configurable resolution
  - ➢ Data interfaces: I2C x 1, USART x 2
  - ➢ Integrate high-performance comparator
- ■ Ultra low power consumption: 14.3mA@Transmit, 0.5uA@PowerMode3
- ■ Antenna: PCB antenna

BDE-BLEM201P highly integrates Bluetooth Low Energy radio, stack, profile and applications in a SoC, without the need of using an external MCU. The module also offers flexible hardware interfaces for the sensor application.

It enables ultra low power connectivity and data transfer for the applications that are sensitive to power consumption, size and cost.

## Applications

- ■ Medical devices
- ■ Sports and fitness equipments
- ■ Home electronics
- ■ Mobile and PC accessories
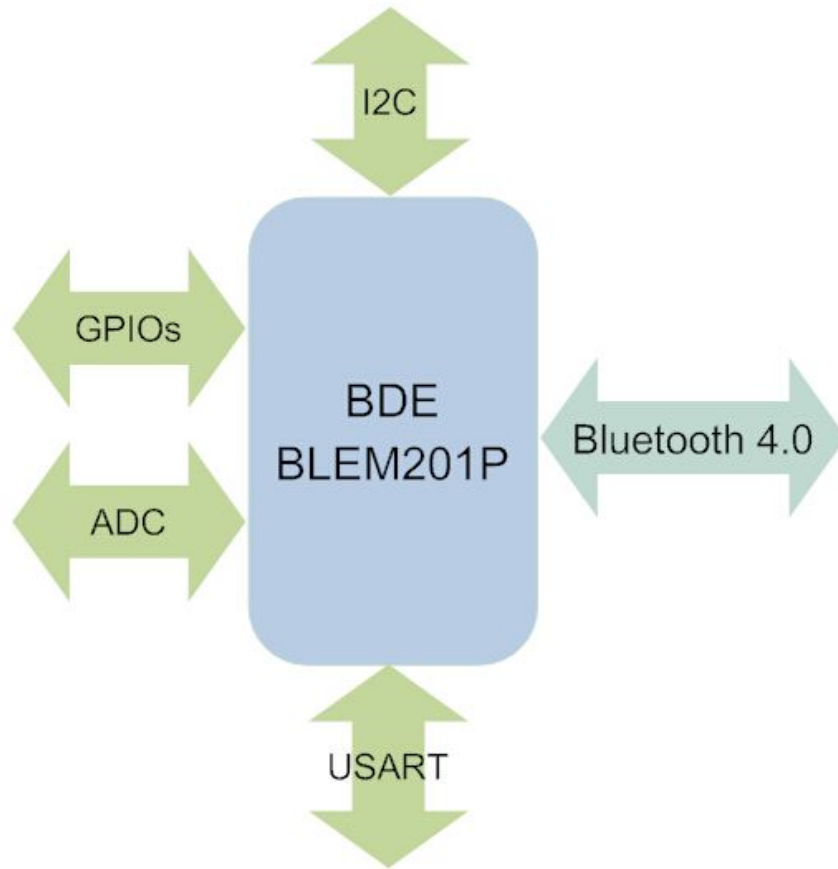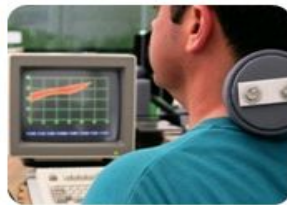- ■ Industry automation

## Block Diagram



Fig. 1: Block diagram of BDE-BLEM201P

## Electrical Characteristics

■ Absolute maximum rating

| Rating | Min | Typ | Max | Unit |
|---|---|---|---|---|
| Storage Temperature | -40 | - | 125 | ℃ |
| VDD | -0.3 | - | 3.9 | V |
| Other Terminals | -0.2 | - | VDD+0.3≤3.9 | V |

■ Recommended operating conditions

| Rating | Min | Typ | Max | Unit |
|---|---|---|---|---|
| Operating Temperature | -40 | - | 85 | ℃ |
| VDD | 2 | 3.3 | 3.6 | V |

## Overall Dimensions

Fig. 2 shows the overall dimensions of BDE-BLEM201P. The module measures 16.55mm long by 10.88mm wide by 1.5mm high without board level shield.
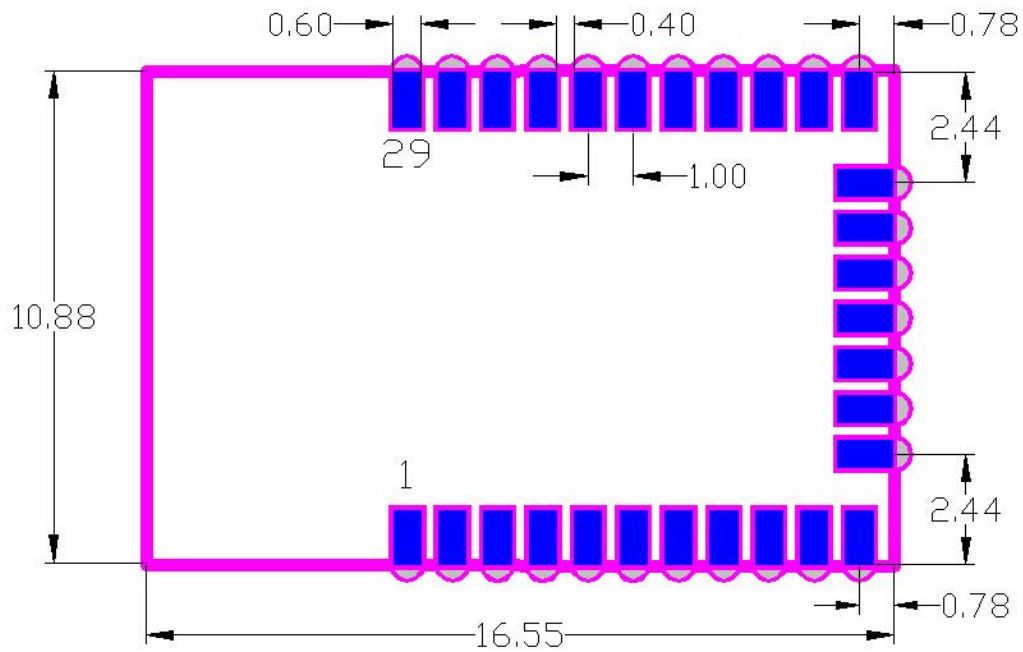


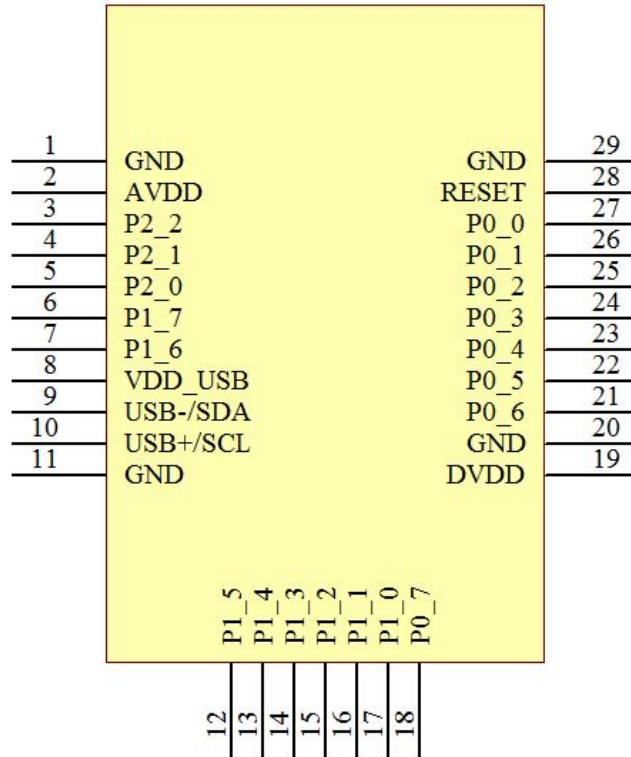Fig. 2: Overall Dimensions of BDE-BLEM201P

## Pin Definitions



Fig. 3: The pinout of BDE-BLEM201P

Table 2: Pin definitions of BDE-BLEM201P

| Pin Number | Pin Name | Definitions |
|---|---|---|
| 1 | GND | Power ground |
| 2 | AVDD | Power supply for analog circuit |
| 3 | P2.2 | GPIO |
| 4 | P2.1 | GPIO |
| 5 | P2.0 | GPIO |
| 6 | P1.7 | GPIO |
| 7 | P1.6 | GPIO |
| 8 | NC | NC |
| 9 | SDA | Serial clock of I2C |
| 10 | SCL | Serial data of I2C |
| 11 | GND | Power ground |

| 12 | P1.5 | GPIO |
|---|---|---|
| 13 | P1.4 | GPIO |
| 14 | P1.3 | GPIO |
| 15 | P1.2 | GPIO |
| 16 | P1.1 | GPIO |
| 17 | P1.0 | GPIO |
| 18 | P0.7 | GPIO |
| 19 | DVDD | Power supply of digital circuit |
| 20 | GND | Power ground |
| 21 | P0.6 | GPIO |
| 22 | P0.5 | GPIO |
| 23 | P0.4 | GPIO |
| 24 | P0.3 | GPIO |
| 25 | P0.2 | GPIO |
| 26 | P0.1 | GPIO |
| 27 | P0.0 | GPIO |
| 28 | RESET | Reset pin, active low |
| 29 | GND | Power ground |
| 30 | RF GND | RF ground |
| 31 | RF | Power port |
| 32 | RF GND | RF ground |

Table 3: Peripheral IO pin mapping

| PERIPHERAL / FUNCTION | P0 | | | | | | | | P1 | | | | | | | | P2 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | 2 | 1 | 0 |
| ADC | A7 | A6 | A5 | A4 | A3 | A2 | A1 | A0 | | | | | | | | | | | |
| Operational amplifier | | | | | | O | - | + | | | | | | | | | | | |
| Analog comparator | | | + | - | | | | | | | | | | | | | | | |
| USART 0 SPI | | | C | SS | MO | MI | | | | | | | | | | | | | |
| Alt. 2 | | | | | | | | | | | MO | MI | C | SS | | | | | |
| USART 0 UART | | | RT | CT | TX | RX | | | | | | | | | | | | | |
| Alt.2 | | | | | | | | | | | TX | RX | RT | CT | | | | | |
| USART 1 SPI | | | MI | MO | C | SS | | | | | | | | | | | | | |
| Alt.2 | | | | | | | | | MI | MO | C | SS | | | | | | | |
| USART 1 UART | | | RX | TX | RT | CT | | | | | | | | | | | | | |
| Alt.2 | | | | | | | | | RX | TX | RT | CT | | | | | | | |
| TIMER 1 | | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | |
| Alt.2 | 3 | 4 | | | | | | | | | | | | 0 | 1 | 2 | | | |
| TIMER 3 | | | | | | | | | | | | 1 | 0 | | | | | | |
| Alt.2 | | | | | | | | | 1 | 0 | | | | | | | | | |
| TIMER 4 | | | | | | | | | | | | | | 1 | 0 | | | | |
| Alt.2 | | | | | | | | | | | | | | | | | | | 0 |
| DEBUG | | | | | | | | | | | | | | | | | DC | DD | |
| OBSSEL | | | | | | | | | | | 5 | 4 | 3 | 2 | 1 | 0 | | | |

# Module Location

In order to get a fine performance when integrate the module to your product, it is advised to use the recommended module location to the respective PCB.
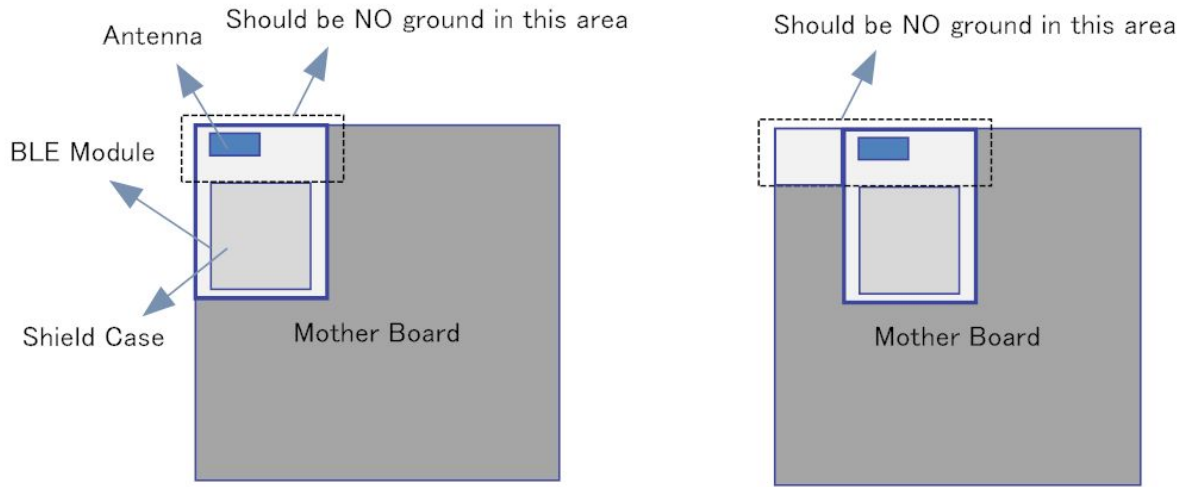
■ Location in X-Y plane



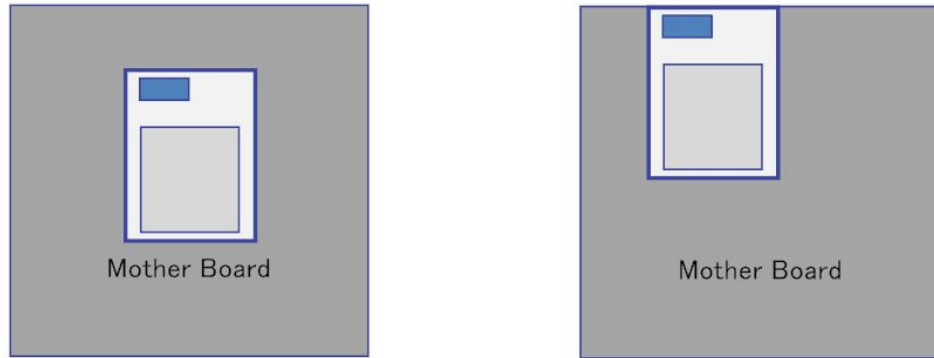Fig. 4: Recommended location in X-Y plane



Fig. 5: Not recommended location in X-Y plane
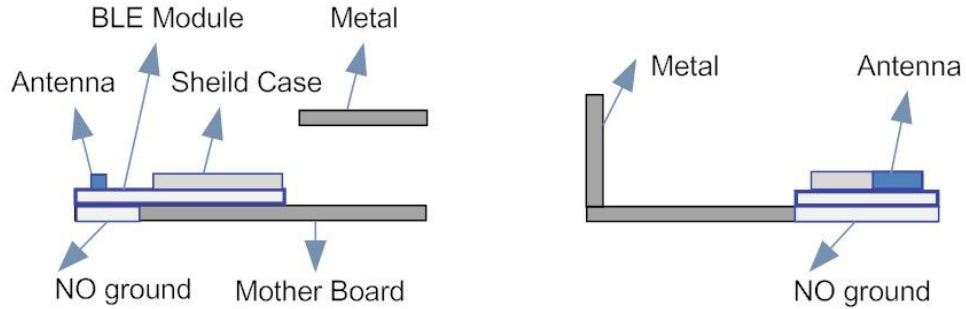
■  Location in Z plane
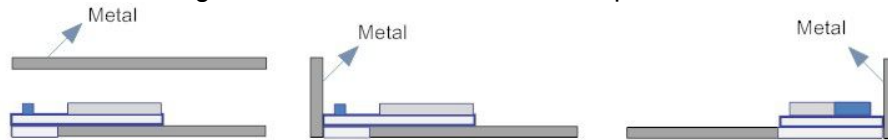


Fig. 6: Recommended location in Z plane



Fig. 7: Not recommended location in Z plane

Caution: The user is cautioned that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.
If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

-- Reorient or relocate the receiving antenna.

-- Increase the separation between the equipment and receiver.

-- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

-- Consult the dealer or an experienced radio/TV technician for help.

**FCC Radiation Exposure Statement:**

This equipment complies with FCC 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.

The module in this product is labeled with its own FCC ID and IC No.. The FCC ID and IC is not visible when the module is installed inside another device. Therefore, the outside of the device into which the module is installed must also display a label referring to the module. The final end device must be labeled in a visible area with the following

"Contains FCC ID: 2ABRUBDLEM201P"

## Contacts

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