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# BLE MESH MODULE - PT825XXBTV1

**This datasheet is dedicated for**
**Plexilent BLE Mesh module PT825XXBTV1 : Version 1**

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The PT825XXBTV1 is Plexilent developed module based on Bluetooth LE SoC solution with internal flash and is completely RoHS compliant and 100% lead (Pb)-free is well suited for connected lighting and automation solutions. It consists of a highly integrated Bluetooth chip and several peripheral components, with an embedded Bluetooth network protocol stack and rich library functions.

## 1 Overview

The PT825XXBTV1 integrates a power-balanced 32-bit MCU, BLE/2.4GHz Radio, 48kB SRAM, 512kB internal Flash, 14bit ADC, 6-channel PWM (1-channel IR/IR FIFO/IR DMA FIFO) and flexible GPIO interfaces.

### 1.1 Features

Embedded low-power 32-bit MCU, which can also function as an application processor.

- Clock rate: 48 MHz
- Operating voltage: 1.8 V to 3.6 V (Under 1.8 V to 2.7 V, the module can start but the RF performance is not guaranteed. Under 2.8 V to 3.6 V, the module performance is normal.)
- Peripherals: Six pulse width modulation (PWM) interfaces.
- Bluetooth RF features
  – Bluetooth LE 5.0
  – Up to 2 Mbit/s RF data rate
  – TX power: +10 dBm
  – RX sensitivity: – 94.5 dBm at 1 Mbit/s
- Embedded advanced encryption standard (AES) hardware encryption
- Onboard PCB antenna with 2.5 dBi gain
- Operating temperature: – 40°C to +125°C

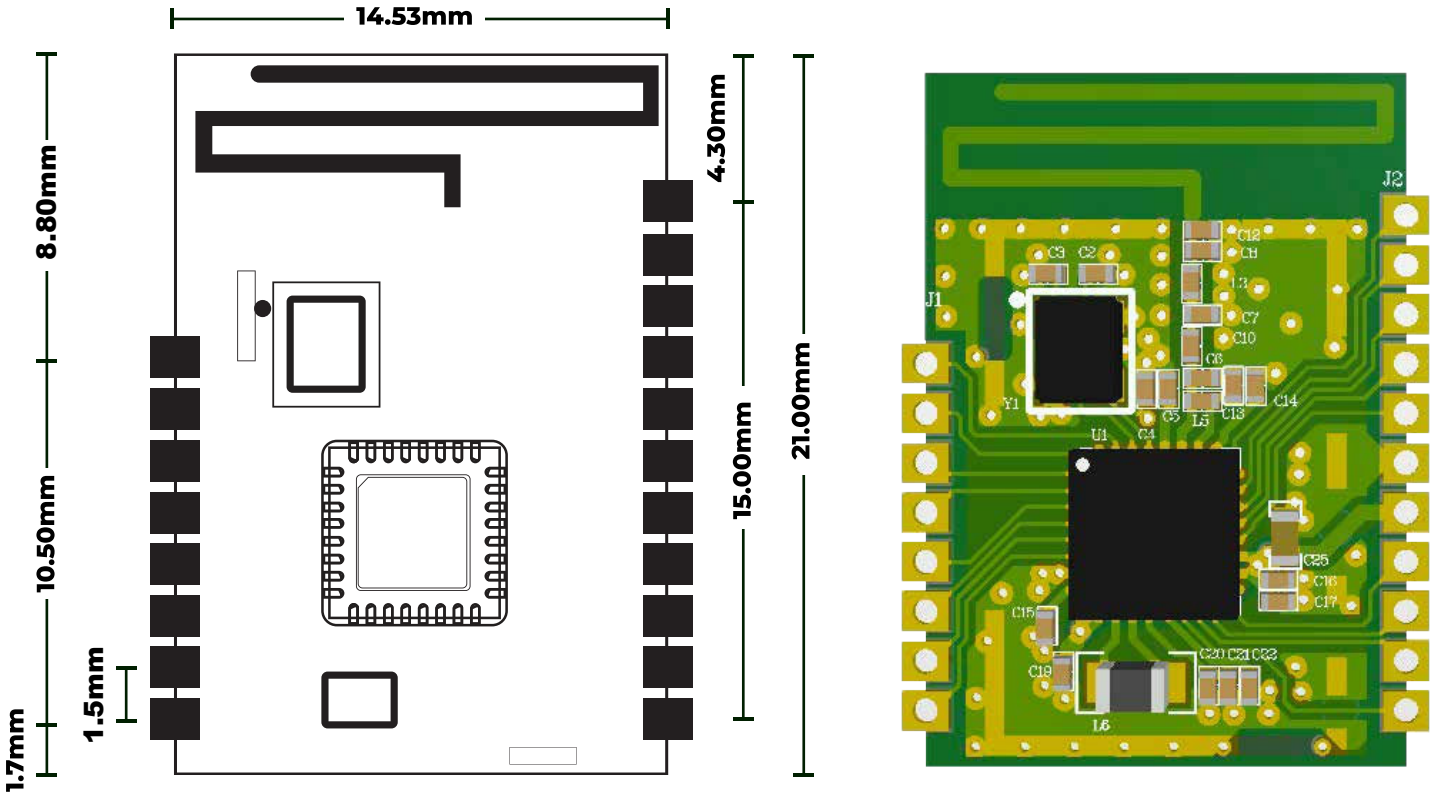
### 1.2 Applications

- Smart LED lights
- Smart households
- Smart low-power sensors

## 2 Module interfaces

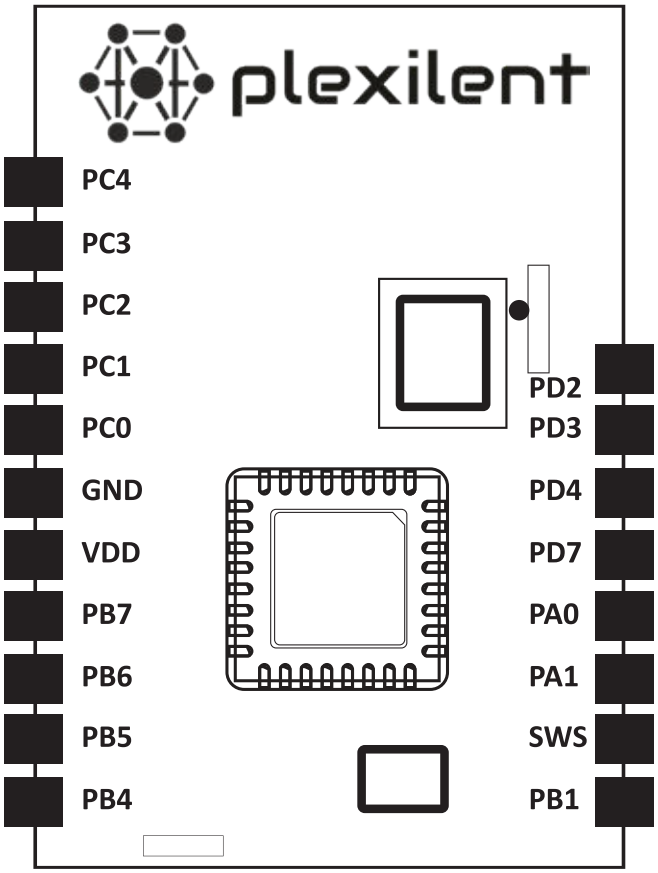
### 2.1 Dimensions and footprint

The PT825XXBTV1 dimensions (H x W x L) are 2 mm x 14.53 mm x 21 mm. The PCB thickness is 1 ±0.1 mm. The PT825XXBTV1 pins are shown below:

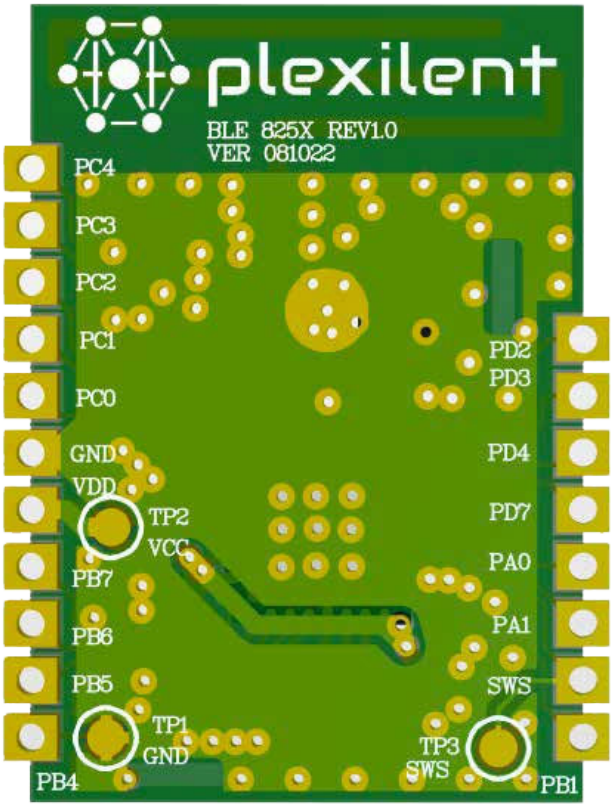



*Front View

*Back View




*Back View



### 2.2 Pin definition

The following table shows definitions of pins:

| Pin No. | Symbols | I/O type | Function |
|---|---|---|---|
| 1 | PC4 | I/O | I/O used for PWM Output, PWM2/P0N, 14-bit ADC |
| 2 | PC3 | I/O | I/O pin programmed to drive Warm White LED as PWM Output |
| 3 | PC2 | I/O | I/O pin programmed to drive White LED as PWM Output |
| 4 | PC1 | I/O | I/O used for PWM Output, PWM1/I2C_SCK |
| 5 | PC0 | I/O | I/O used for PWM Output, PWM4/I2C_SDA |
| 6 | GND | P | Power Supply Reference to Ground Pin |
| 7 | VDD | P | Power Supply Pin (3.3V) |
| 8 | PB7 | I/O | Serial Interface receiving pin (UART RX), SPI_DO, 14-bit ADC |
| 9 | PB6 | I/O | SPI_DI, 14-bit ADC |
| 10 | PB5 | I/O | I/O used for PWM Output, PWM5 |
| 11 | PB4 | I/O | I/O used for PWM Output, PWM4 |
| 12 | PD2 | I/O | I/O pin programmed to drive Red LED as PWM Output |
| 13 | PD3 | I/O | I/O used for PWM Output, PWM1N |
| 14 | PD4 | I/O | I/O pin programmed to drive Green LED as PWM Output |
| 15 | PD7 | I/O | SPI_CK, Serial Interface receiving pin (UART TX) |
| 16 | PA0 | I/O | I/O used for PWM Output, PWM0N |
| 17 | PA1 | I/O | GPIO |
| 18 | SWS | I | Single Wire Slave used for Programming |
| 19 | PB1 | I/O | I/O pin programmed to drive Blue LED as PWM Output |

Note:
1. P signifies a power supply pin, I/O represents an input/output pin, and AI denotes an analog input pin.
2. If you have any particular needs for controlling light colors via PWM outputs, please contact the business personnel at Plexilent.

## 3 Electrical parameters

### 3.1 Absolute electrical parameters

| Parameter | Description | Minimum Value | Maximum Value | Unit |
|---|---|---|---|---|
| Ts | Storage temperature | -65 | 150 | ℃ |
| VCC | Power supply voltage | -0.3 | 3.9 | V |
| ESD voltage (human body model) | TAMB-25℃ | - | 2 | KV |
| ESD voltage (human body model) | TAMB-25℃ | - | 0.5 | KV |

### 3.2 Electrical conditions

| Parameter | Description | Minimum Value | Typical value | Maximum Value | Unit |
|---|---|---|---|---|---|
| Ts | Working temperature | -40 | - | 85 | ℃ |
| VCC | Working voltage | 2.8 | 3.3 | 3.6 | V |
| $V_{IL}$ | I/O low-level input | VSS | - | VCC*0.3 | V |
| $V_{IH}$ | I/O low-level input | VCC*0.7 | - | VCC | V |
| $V_{OL}$ | I/O low-level input | VSS | - | VCC*0.1 | V |
| $V_{OH}$ | I/O high-level output | VCC*0.9 | - | VCC | V |

## 4 RF features

### 4.1 Basic RF features

| Parameter | Description |
|---|---|
| Frequency band | 2.4GHz ISM band |
| Wireless standard | Bluetooth LE 4.2/5.0 |
| Data transmission rate | 1 Mbps, 2 Mbps |
| Antenna type | Onboard PCB antenna |

### 4.2 RF output power

| Parameter | Minimum Value | Typical value | Maximum Value | Unit |
|---|---|---|---|---|
| Average RF output power | -22 | 10 | 10.5 | dBm |
| 20 dB modulation signal bandwidth (1 Mbit/s) | - | 2500 | - | KHz |
| 20 dB modulation signal bandwidth (2 Mbit/s) | - | 1400 | - | KHz |

## 4 RF features

### 4.3 RF RX sensitivity

| Parameter | Minimum Value | Typical value | Maximum Value | Unit |
|---|---|---|---|---|
| RX sensitivity 1Mbps | - | -94.5 | - | dBm |
| RX sensitivity 2Mbps | - | -91 | - | dBm |
| Frequency offset 1Mbps | -250 | - | +300 | KHz |
| Frequency offset 2Mbps | -300 | - | +200 | KHz |
| Co-channel interference suppression | - | -10 | - | dB |

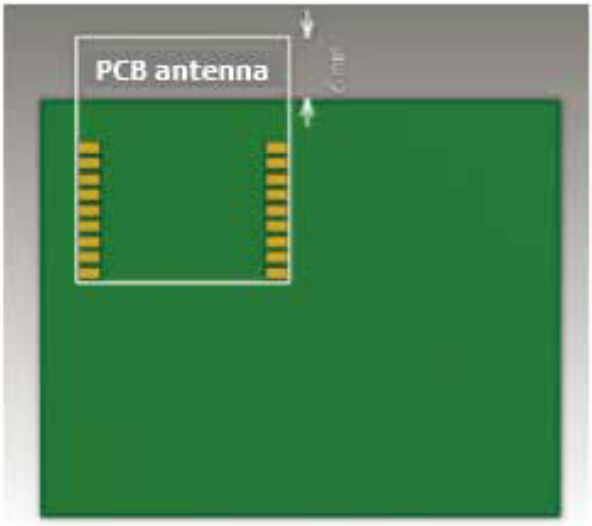
## 5 Antenna

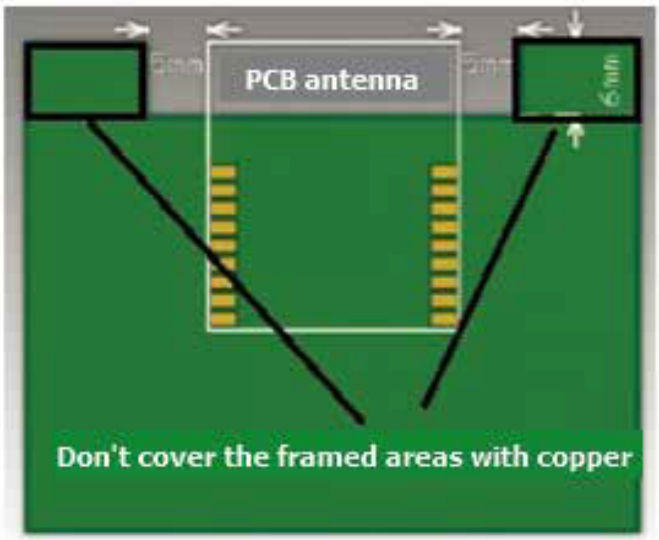
### 5.1 Antenna type

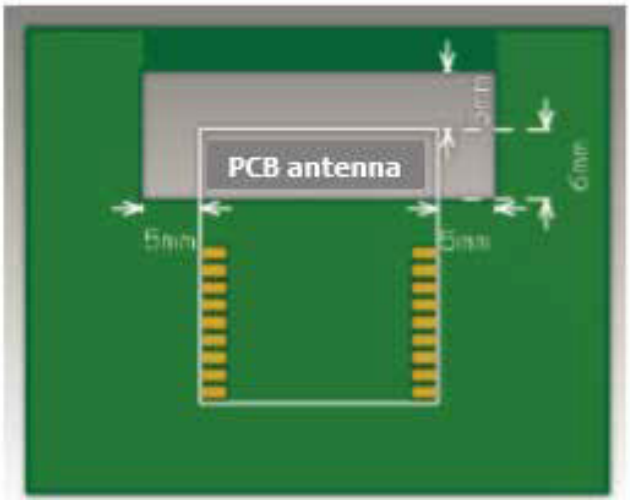
PT825XXBTV1 uses an onboard PCB antenna with a gain of 2.5 dBi.

### 5.2 Antenna interference reduction

For optimal RF performance, it is advisable to keep the antenna at a minimum distance of 15 mm from other metal components. Presence of metal objects in close proximity to the antenna may significantly diminish wireless signal strength, ultimately impacting the RF performance. Therefore, when creating a final product, sufficient space must be allocated for the antenna.



## 6 MOQ and packaging information

| Product Series | Temperature Range | Production Description | Product Part No. | Minimum Order Quantity |
|---|---|---|---|---|
| PT8251XBTV1 | -40°C ~ 85°C | Dimmable Modules (1CH) | PT8251ABTV1 | 1000 |
| | -40°C ~ 105°C | | PT8251BBTV1 | 1000 |
| | -40°C ~ 125°C | | PT8251CBTV1 | 1000 |
| PT8252XBTV1 | -40°C ~ 85°C | CCT Tunables & Dimmable Modules (CCT) | PT8252ABTV1 | 1000 |
| | -40°C ~ 105°C | | PT8252BBTV1 | 1000 |
| | -40°C ~ 125°C | | PT8252CBTV1 | 1000 |
| PT8253XBTV1 | -40°C ~ 85°C | RGB Tunables & Dimmable Modules (RGB) | PT8253ABTV1 | 1000 |
| | -40°C ~ 105°C | | PT8253BBTV1 | 1000 |
| | -40°C ~ 125°C | | PT8253CBTV1 | 1000 |
| PT8254XBTV1 | -40°C ~ 85°C | RGB WW Tunables & Dimmable Modules (4CHWW) | PT8254ABTV1 | 1000 |
| | -40°C ~ 105°C | | PT8254BBTV1 | 1000 |
| | -40°C ~ 125°C | | PT8254CBTV1 | 1000 |
| PT8255XBTV1 | -40°C ~ 85°C | RGBCW Tunables & Dimmable Modules (4CHCW) | PT8255ABTV1 | 1000 |
| | -40°C ~ 105°C | | PT8255BBTV1 | 1000 |
| | -40°C ~ 125°C | | PT8255CBTV1 | 1000 |
| PT8256XBTV1 | -40°C ~ 85°C | RGBCWWW Tunables & Dimmable Modules (RGBCW) | PT8256ABTV1 | 1000 |
| | -40°C ~ 105°C | | PT8256BBTV1 | 1000 |
| | -40°C ~ 125°C | | PT8256CBTV1 | 1000 |
| PT8257XBTV1 | -40°C ~ 85°C | Isolated CCT Tunables & Dimmable Modules (CCTI) | PT8257ABTV1 | 1000 |
| | -40°C ~ 105°C | | PT8257BBTV1 | 1000 |
| | -40°C ~ 125°C | | PT8257CBTV1 | 1000 |
| PT8258XBTV1 | -40°C ~ 85°C | Dimmable Modules For Fan (FAN) | PT8258ABTV1 | 1000 |
| | -40°C ~ 105°C | | PT8258BBTV1 | 1000 |
| | -40°C ~ 125°C | | PT8258CBTV1 | 1000 |

**IMPORTANT NOTICE**

- Based on security issues, please ensure that the positive pole of the power in the product don't contact with the machine of metal material directly, or use the insulating materials for isolation, avoid short circuit and dangerous in the assembly of the product.

- Avoid twisting, bending, strong collision and falling damage in the assembly of this product. Please take care about ESD every time.

**7 ANNEXURE**

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