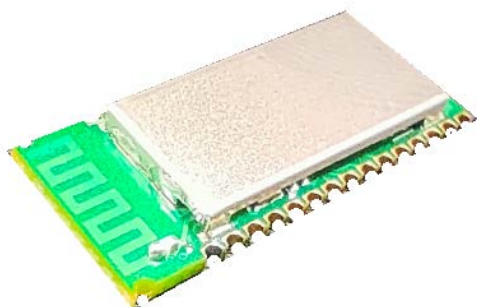


# Leadtek Bluetooth Module

## LRBT01



Rev 0.1

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## Change History

| Rev. | Date       | Change Description | Modified by | Remark |
|------|------------|--------------------|-------------|--------|
| 0.1  | 2020/07/01 | Draft              |             |        |

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# 1 Introduction

Leadtek new generation LRBT01H Bluetooth module products

The main unit's circuitry consists of a device chipset; the nRF52810 Microcontroller Unit and 2.4G RF, the nRF52810 chip has UART output interface transform. The system is powered by system supply with a nominal voltage of 3.3V volts.

The nRF52810 Microcontroller is the main processor responsible for driving the RF 2.4GHz signal communicate and data link to UART interface transform.

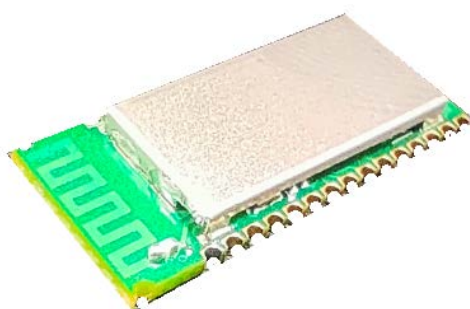


Figure 1-1 : LR BT01 Image

## 1.1 Features

### 1.1.1 Performance

- 2.4 GHz transceiver
  - -96 dBm sensitivity in Bluetooth® low energy mode
  - 1 Mbps, 2 Mbps supported data rates
  - Single-pin antenna interface
  - 5.3 mA peak current in TX (0 dBm)
  - 5.4 mA peak current in RX
  - RSSI (1 dB resolution)
- ARM® Cortex®-M4 32-bit processor with FPU, 64 MHz
  - 215 EEMBC CoreMark® score running from flash memory
  - 58 µA/MHz running from flash memory
  - 51.6 µA/MHz running from RAM
  - Data watchpoint and trace (DWT), embedded trace macrocell (ETM), and instrumentation trace macrocell (ITM)
  - Serial wire debug (SWD)
  - Trace port
  - Flexible power management
  - Supply voltage range 2.6 V–3.6 V
  - Fully automatic LDO and DC/DC regulator system
  - Fast wake-up using 64 MHz internal oscillator

### 1.1.2 Hardware and Software

- Support for concurrent multi-protocol
- 12-bit, 200 ksps ADC - 8 configurable channels with programmable gain
- 64 level comparator
- 15 level low power comparator with wakeup from System OFF mode
- General purpose I/O pins
- Digital microphone interface (PDM)
- 5x 32-bit timers with counter mode
- Up to SPI master/slave with EasyDMA
- Up to I2C compatible 2-Wire master/slave
- UART (CTS/RTS) with EasyDMA
- Programmable peripheral interconnect (PPI)
- AES HW encryption with EasyDMA

## 1.2 Advantages

- 2.4 GHz transceiver
- -96 dBm sensitivity in *Bluetooth*® low energy mode
- 1 Mbps, 2 Mbps supported data rates

Flexible power management

- Supply voltage range 2.6 V–3.6 V
- Fully automatic LDO and DC/DC regulator system
- Serial wire debug (SWD)

## 1.3 Block Diagram

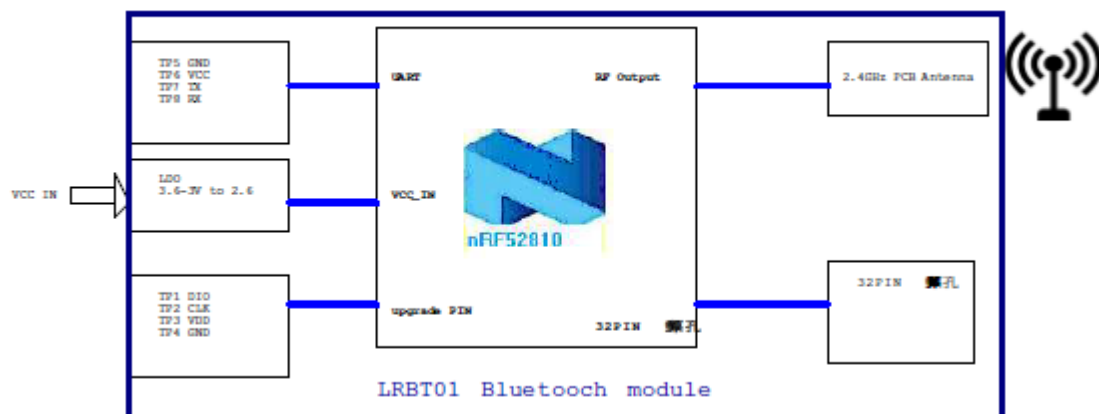


Figure 1-2 : LR BT01 Block Diagram

## 2 Technical Specification

### 2.1 Hardware Features

- Based on the high performance features of Nordic™ low power single chipset
- SMT pads allow for fully automatic assembly processes equipment and reflow soldering
- RoHS compliant (lead-free and Halogen free)

#### 2.1.1 Hardware Specification

|                              |                                |
|------------------------------|--------------------------------|
| Specification                | BT01                           |
| Processor                    | Nordic/ NRF52810               |
| Product                      | BLUETOOTH Module               |
| connector                    | 32Pin                          |
| Form Factor Size *DIMENSIONS | 23x10.2x2.65mm                 |
| WEIGHT                       | 1,8g                           |
| BT4.0 & BLE                  | BT 4.0 & BT 5.0                |
| RF(Frequency)                | 2.402~2.480GHz                 |
| RX Sensitivity               | -90 dBm                        |
| Antenna                      | PCB Antenna                    |
| Communication range          | BLE: 50m                       |
| Communication range          | BLE: 50m                       |
| Power consumption            | *.Transmitting mode < 15mA     |
| Power consumption            | *.Receiving mode < 22mA        |
| Environment                  | *.standby mode < 8.5mA         |
| Environment                  | *.Operating temperature-30~75℃ |
| Environment                  | *.Storage temperature-30~75℃   |
| Power supply                 | *.Operating Humidity max.95%RH |
|                              | 2.6~3.6V                       |
| LED Indicator                | NA                             |
| Data Rate                    | 77.7k bps                      |
| Compatibility                | NA                             |
| Interface                    | UART / I2C /--                 |
| UART Baud Rate               | 115200 ~ 230400                |
| Regulatory/ Compliance       | NCC                            |
|                              |                                |

Table 2-1 : Hardware Specification

## 2.1.2 Electrical Characteristics

| Operation Conditions           |      |      |      |       |
|--------------------------------|------|------|------|-------|
| Parameter                      | Min. | Typ. | Max. | Units |
| Input Operation supply voltage | 2.6  | 3.3v | 3.6  | V     |
| Peak supply current            | --   | 15   | --   | mA    |
| Standby Backup current         | --   | --   | 60   | uA    |
| I/O Input high level (VIH)     | 1.82 | --   | 2.52 | V     |
| I/O Input low level (VIL)      | 0    | --   | 0.4  | V     |
| I/O Output high level (VoH)    | 1.8  | 3.3  | 3.6  | V     |
| I/O Output low level (VoL)     | 0    | --   | 0.4  | V     |

Table 2-2 : Electrical Characteristics

## 2.1.3 Pin Location

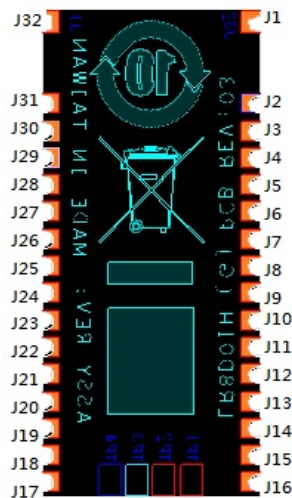


Figure 2-1 : Pin Location

## 2.1.4 Pin Assignment

| Pin # | Name     | Type | Description                                             |
|-------|----------|------|---------------------------------------------------------|
| 1     | EXT_ANT  | ANT  | EXTERNAL ANTENNA PIN                                    |
| 2     | SWDCLK   | I    | Serial wire debug clock input for debug and programming |
| 3     | Reserved | N/A  | Keep floating                                           |
| 4     | VCC_IN   | PWS  | DC +3.6~2.6V input                                      |
| 5     | Reserved | N/A  | Keep floating                                           |
| 6     | Reserved | N/A  | Keep floating                                           |

|     |                       |     |                                                            |
|-----|-----------------------|-----|------------------------------------------------------------|
| 7   | Reserved              | N/A | Keep floating                                              |
| 8   | Digital I/O           | I/O | General purpose I/O                                        |
| 9   | Digital I/O           | I/O | General purpose I/O                                        |
| 10  | Digital I/O           | I/O | General purpose I/O SAADC/COMP/LPCOMP input                |
| 11  | Digital I/O           | I/O | General purpose I/O SAADC/COMP/LPCOMP input                |
| 12  | Reserved              | N/A | Keep floating                                              |
| 13  | Reserved              | N/A | Keep floating                                              |
| 14  | Reserved              | N/A | Keep floating                                              |
| 15  | Digital I/O           | N/A | General purpose I/O SAADC/COMP/LPCOMP input                |
| 16  | Reserved              | N/A | Keep floating                                              |
| 17  | Reserved              | N/A | Keep floating                                              |
| 18  | Reserved              | N/A | Keep floating                                              |
| 19  | Reserved              | N/A | Keep floating                                              |
| 20  | Reserved              | N/A | Keep floating                                              |
| 21  | Reserved              | N/A | Keep floating                                              |
| 22  | SWDIO                 | I/O | Serial wire debug I/O for debug and programming            |
| 23  | Digital I/O           | I   | General purpose I/O, default UART RX                       |
| 24  | Digital I/O           | O   | General purpose I/O ,default UART TX                       |
| 25  | TRACEDATA[0]<br>/ SWO | I/O | General purpose I/O Single wire output / Trace port output |
| 26  | TRACECLK              | I/O | General purpose I/O<br>Trace port clock output             |
| 27  | Reserved              | N/A | Keep floating                                              |
| 28  | nRESET                | I/O | Configurable as pin reset                                  |
| 29  | Reserved              | N/A | Keep floating                                              |
| 30  | Reserved              | N/A | Keep floating                                              |
| 31  | VSS                   | PWS | Ground                                                     |
| 32  | Reserved              | N/A | Keep floating                                              |
| TP1 | SWDIO                 | I/O | Serial wire debug I/O for debug and programming            |
| TP2 | SWDCLK                | I   | Serial wire debug clock input for debug and programming    |
| TP3 | VCC_3V                | PWS | DC +3V input                                               |
| TP4 | VSS                   | PWS | Ground                                                     |
| TP5 | VSS                   | PWS | Ground                                                     |
| TP6 | VCC_3V                | PWS | DC +3V input                                               |
| TP7 | Reserved              | N/A | Keep floating                                              |
| TP8 | Reserved              | N/A | Keep floating                                              |

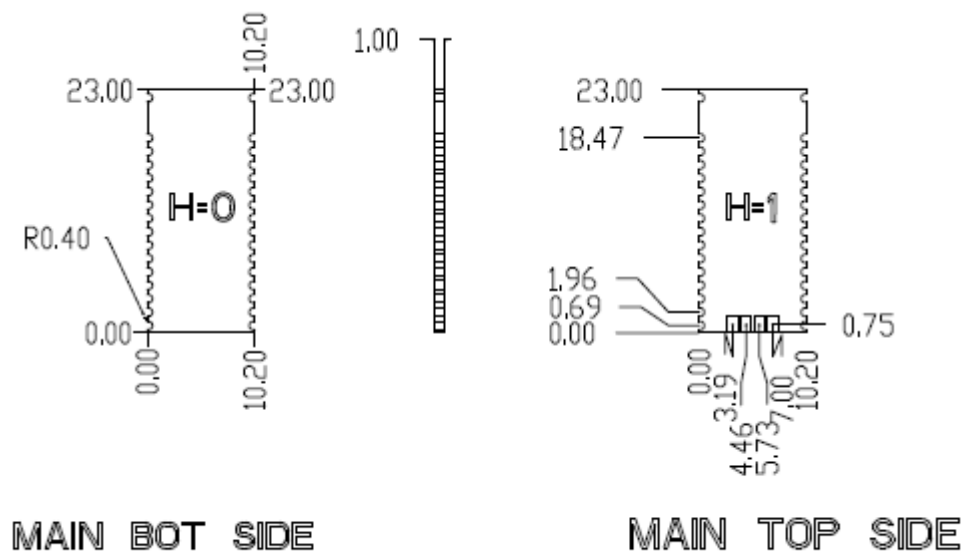
Table 2-3 : Pin Assignment

## 2.2 Physical Specification

- Physical dimensions of the LR BT01 Bluetooth module are as follow:

| Items  | Description   |
|--------|---------------|
| Length | 23 ± 0.3 mm   |
| Width  | 10.2 ± 0.3 mm |
| Height | 2.65 ± 0.3 mm |
| Weight | 1.8 g         |

Table 2-4 : Module's Dimension



## 2.3 Environmental Specification

| Item                        | Description                                                         |
|-----------------------------|---------------------------------------------------------------------|
| Operating temperature range | -30 deg. C to +75 deg. C                                            |
| Storage temperature range   | -35 deg. C to +75 deg. C                                            |
| Humidity                    | Up to 95% non-condensing or a wet<br>Bulb temperature of +35 deg. C |

Table 2-5 : Environmental Specification

## 2.4 ESD Specification

- Air Discharge : 2 KV / 4KV / 8KV (direct)
- Contact Discharge : 2KV / 4KV (direct/indirect)

## Contact

### Headquarters and Global Market Administration

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## 3 Appendix

TBA

## 4 Federal Communications Commission (FCC) Statement

You are cautioned that changes or modifications not expressly approved by the part 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 of the device.

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 RF Radiation Exposure Statement:

The product comply with the FCC portable RF exposure limit set forth for an uncontrolled environment and are safe for intended operation as described in this manual. The further RF exposure reduction can be achieved if the product can be kept as far as possible from the user body or set the device to lower output power if such function is available.

The final end product must be labeled in a visible area with the following: "Contains Transmitter Module FCC ID: I2ILRBT01,"".

This module has been granted modular approval for mobile applications. OEM integrators for host products may use the module in their final products without additional FCC certification if they meet the following conditions. Otherwise, additional FCC approvals must be obtained.

The host product with the module installed must be evaluated for simultaneous transmission requirements.

The users manual for the host product must clearly indicate the operating requirements and conditions that must be observed to ensure compliance with current FCC RF exposure guidelines.

To comply with FCC regulations limiting both maximum RF output power and human exposure to RF radiation, the maximum antenna gain including cable loss in a mobile-only exposure condition must not exceed {Insert Reference to Your Antenna Information Here}.

This modular transmitter is only FCC authorized for the specific rule parts (i.e., FCC transmitter rules) listed on the grant, and that the host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. If the grantee markets their product as being Part 15 Subpart B compliant (when it also contains unintentional-radiator digital circuitry), then the grantee shall provide a notice stating that the final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.

This device is intended for OEM integrators under the following conditions

- The antenna must be installed so 20 cm of space is maintained between the antenna and the users.
- The transmitter module may not be co-located with any other transmitter of antenna.
- To comply with FCC regulations limiting maximum RF output power and human exposure to RF radiation, the maximum antenna gain including cable loss in a mobile exposure condition must not exceed: 0.83 dBi.

In the event that these conditions cannot be met (for example, certain laptop configurations or colocation with another transmitter), then the FCC authorization is no longer considered valid and the FCC 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.

The OEM integrator must 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 must include all required regulatory information/warning as shown in this manual. For more information, refer to the OEM Integrator's Guide.

## OEM Guidance

### 1. Applicable FCC rules

This module is granted by Single Modular Approval. It complies to the requirements of FCC part 15.247.

### 2. The specific operational use conditions

This module can be used in lot devices. The input voltage to the module is nominally 3.3V DC. The operational ambient temperature of the module is -35 °C - 75°C. The PCB antenna has been fixed, any other external antenna is prohibited.

### 3. Limited module procedures

N/A

### 4. Trace antenna design

N/A

### 5. RF exposure considerations

The 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. If the equipment built into a host as a portable usage, the additional RF exposure evaluation may be required as specified by 2.1091.

### 6. Antenna

Antenna type: PCB antenna Peak gain: 0.83dBi

### 7. Label and compliance information

An exterior label on OEM's end product can use wording such as the following: "Contains Transmitter Module FCC ID: I2ILRBT01".

### 8. Information on test modes and additional testing requirements

- a) The modular transmitter has been fully tested by the module grantee on the required number of channels, modulation types, and modes, it should not be necessary for the host installer to re-test all the available transmitter modes or settings. It is recommended that the host product manufacturer, installing the modular transmitter, perform some investigative measurements to confirm that the resulting composite system does not exceed the spurious emissions limits or band edge limits (e.g., where a different antenna may be causing additional emissions).
- b) The testing should check for emissions that may occur due to the intermixing of emissions with the other transmitters, digital circuitry, or due to physical properties of the host product (enclosure). This investigation is especially important when integrating multiple modular transmitters where the certification is based on testing each of them in a stand-alone configuration. It is important to note that host product manufacturers should not assume that because the

modular transmitter is certified that they do not have any responsibility for final product compliance.

- c) If the investigation indicates a compliance concern the host product manufacturer is obligated to mitigate the issue. Host products using a modular transmitter are subject to all the applicable individual technical rules as well as to the general conditions of operation in Sections 15.5, 15.15, and 15.29 to not cause interference. The operator of the host product will be obligated to stop operating the device until the interference have been corrected.

- 8. Additional testing, Part 15 Sub part B disclaimer The final host / module combination need to be evaluated against the FCC Part 15B criteria for unintentional radiators in order to be properly authorized for operation as a Part 15 digital device.

FCC Warning:

Any 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

OEM integrators and end users must be provided with transmitter operating conditions for satisfying RF exposure compliance.