

# LCWB-009 User Manual

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WIFI 4 + BLE5.2 MODULE

# 1 CONTENTS

1	CONTENTS .....	1
1	Overview .....	3
2	Software information.....	3
3	Features.....	3
4	Block Diagram .....	4
4.1	Overall Block Diagram.....	4
4.2	SoC Internal Power Distribution.....	4
5	Physical photo.....	5
6	PIN Description .....	6
7	Physical Dimensions.....	10
8	General Specification.....	11
9	Product Specifications.....	11
9.1	Electrical Specifications.....	11
9.1.1	Absolute Maximum Ratings .....	11
9.1.2	Operating conditions .....	11
9.1.3	ESD spec.....	11
9.1.4	Current Consumption (Wi-Fi).....	12
9.1.5	Current Consumption (BLE) .....	13
9.2	Standard Rated Specification .....	13
9.2.1	WIFI.....	13
9.2.2	BLE.....	13
10	RF Specifications.....	14
10.1	RF Characteristics for Wi-Fi.....	14
10.2	RF Characteristics for BLE .....	15
11	Recommended Reflow Profile.....	15
12	Packing information.....	16
12.1	Carrier size Detail:.....	16
13	FCC Statement.....	16
13.1	FCC Part 15.19 Statements:.....	16
13.2	FCC Part 15.105 statement(Class B) .....	16
13.3	FCC Part 15.21 statement .....	17
13.4	Responsible Party Information .....	17

13.5	Modular Approval Statement.....	17
14	ISED Statement .....	19
14.1	Licensed-exempt Statement .....	19
14.2	RF Exposure Statement (MPE) .....	19
14.3	End Product Labeling.....	19
15	Customer Support .....	20
16	Regulatory Notice (CE) .....	20
16.1	Single Point of Contact.....	20
16.2	RF Exposure.....	20
17	UK.....	21
17.1	Simplified Declaration of Conformity .....	21
17.2	Single Point of Contact.....	21
17.3	RF Exposure.....	21

## 1 Overview

LCWB-009 is a highly integrated 1x1 single-band 2.4 GHz Wi-Fi 4(802.11b/g/n) and Bluetooth Low Energy (LE) 5.2 system designed for applications requiring high security and rich resources. A 32-bit integrated Armv 8-M STAR-MC1 microcontroller and a comprehensive set of peripherals for advanced Internet Internet of Things (IoT) applications.

LCWB-009 provides state-of-the-art security based on a powerful security architecture. The module integrates a Platform Security Suite (IPSS) for the Internet of Things for encryption and system security control. IPSS embed the features of comprehensive and powerful security to set up a top-secret execution environment for IoT devices.

Using advanced design technology and ultra-low power process technology, LCWB-009 provides high integration, efficient security, and minimal power consumption for a wide range of advanced IoT applications.

## 2 Software information

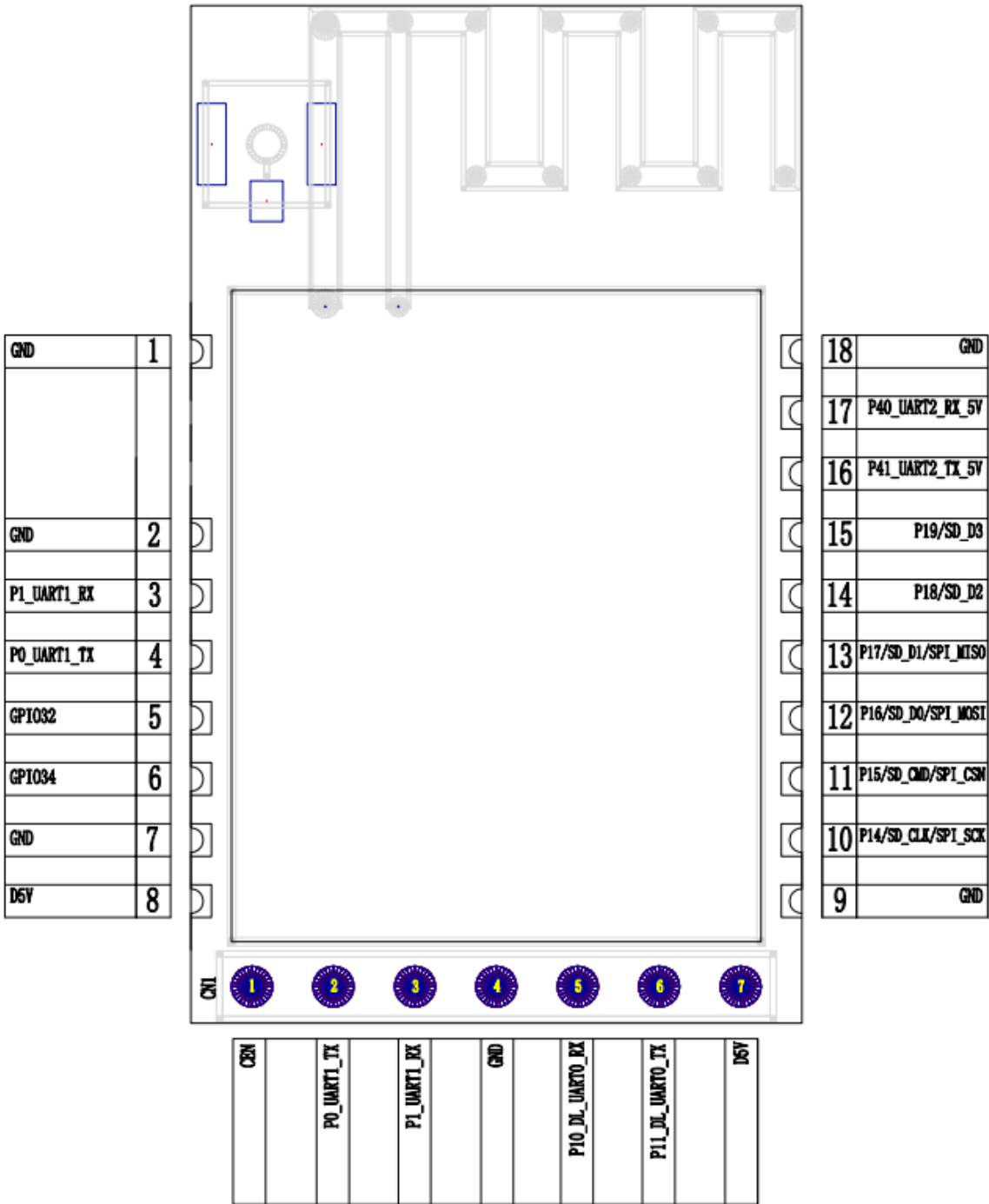
LCWB-009 software information is shown in the table below.

Model	software information	
	Check Sum	Version
LCWB-009	TBD	TBD

## 3 Features

- IEEE 802.11b/g/n 1x1 compliant
- 20 MHz channel bandwidth for 2.4 GHz
- Supports Orthogonal Frequency Division Multiple Access (OFDMA)
- Supports Target Wake Time (TWT)
- TX and RX Low-Density Parity Check (LDPC) support for extended range
- WPA/WPA2/WPA3-Personal support for enhanced security
- Operating modes: STA and SoftAP
- Concurrent SoftAP + STA
- Bluetooth Low Energy (LE) 5.2
- Supports Bluetooth Low Energy 1 Mbps and long range (125 kbps and 500 kbps)
- Supported Bluetooth Low Energy features: LE Audio, 1 Mbps, advertising extensions, and long range
- Security S/W: Beken

6 PIN Description



Module disk interface:

PIN NO.	NAME	TYPE	FUNCTION
1	GND	Power ground	Ground
2	GND	Power ground	Ground
3	P1_UART1_RX	I/O	GPIO1: general-purpose I/O UART1_RX: receive data input I2C1_SDA: serial data SWDIO: serial wire data ADC13: analog input channel LIN_RXD: receive data input
4	P0_UART1_TX	I/O	GPIO0: general-purpose I/O UART1_TX: transmit data output I2C1_SCL: serial clock SWCLK: serial wire clock ADC12: analog input channel LIN_TXD: transmit data output
5	GPIO32_TX_5V	I/O	GPIO32: general-purpose I/O PWGM1_PWM0: PWGM1 channel PWM0 TOUCH6: touch sensing I/O
6	GPIO34_RX_5V	I/O	GPIO34: general-purpose I/O PWGM1_PWM2: PWGM1 channel PWM2 TOUCH8: touch sensing I/O SPI0_CSN: chip select
7	GND	Power ground	Ground
8	D5V	Power VBAT	power supply
9	GND	Power ground	Ground
10	P14/SD_CLK/SPI_SCK	I/O	GPIO14: general-purpose I/O SDIO_CLK: clock SPI0_SCK: serial clock BT_ANT0: Bluetooth antenna select I2C1_SCL: serial clock

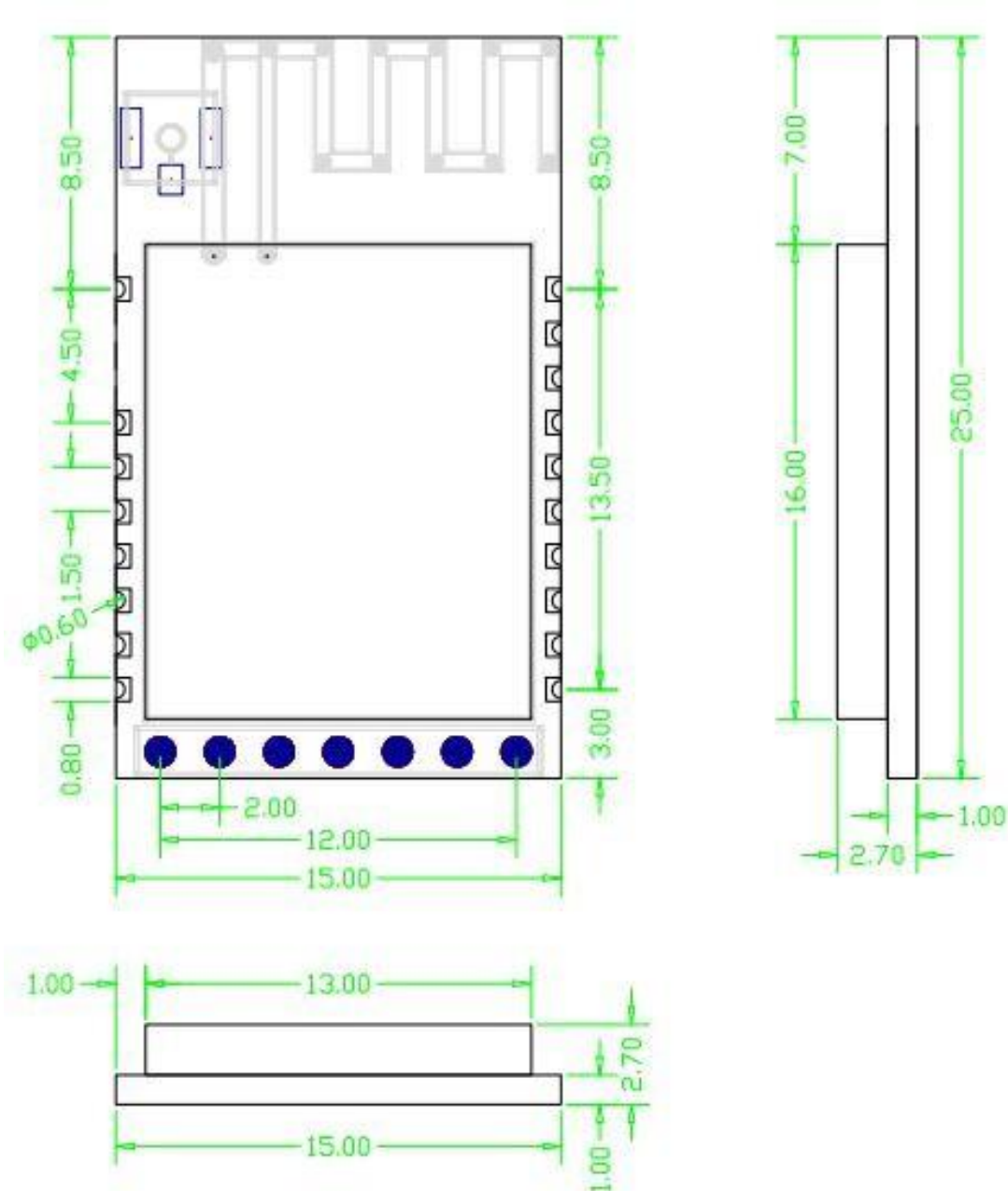
11	P15/SD_CMD/SPI_CS	I/O	GPIO15: general-purpose I/O SDIO_CMD: command/response SPI0_CS: chip select BT_ANT1: Bluetooth antenna select I2C1_SDA: serial data
12	P16/SD_D0/SPI_MOSI	I/O	GPIO16: general-purpose I/O SDIO_DATA0: data SPI0_MOSI: master out slave in BT_ANT2: Bluetooth antenna select
13	P17/SD_D1/SPI_MISO	I/O	GPIO17: general-purpose I/O SDIO_DATA1: data SPI0_MISO: master in slave out BT_ANT3: Bluetooth antenna select
14	P18/SD_D2	I/O	GPIO18: general-purpose I/O SDIO_DATA2: data PWMG0_PWM0: PWMG0 channel PWM0
15	P19/SD_D3	I/O	GPIO19: general-purpose I/O SDIO_DATA3: data PWMG0_PWM1: PWMG0 channel PWM1
16	P41_UART2_TX_5V	I/O	GPIO41: general-purpose I/O UART2_TX: transmit data output LIN_TXD: transmit data output
17	P40_UART2_RX_5V	I/O	GPIO40: general-purpose I/O UART2_RX: receive data input LIN_RXD: receive data input
18	GND	Power ground	Ground

CN1 pinhole interface :

PIN NO.	NAME	TYPE	FUNCTION
1	CEN	I/O	Chip enable, active high
2	P0_UART1_TX	I/O	GPIO0: general-purpose I/O UART1_TX: transmit data output I2C1_SCL: serial clock SWCLK: serial wire clock ADC12: analog input channel LIN_TXD: transmit data output
3	P1_UART1_RX	I/O	GPIO1: general-purpose I/O UART1_RX: receive data input I2C1_SDA: serial data SWDIO: serial wire data ADC13: analog input channel LIN_RXD: receive data input
4	GND	Power ground	Ground
5	P10_DL_UART0_RX	I/O	GPIO10: general-purpose I/O DL_UART_RX: UART flash download receive data input UART0_RX: receive data input SDIO_DATA2: data CLK_AUXS_CIS: CIS master clock (derived from DCO/APLL/CLK_320M/ CLK_480M)
6	P11_DL_UART0_TX	I/O	GPIO11: general-purpose I/O DL_UART_TX: UART flash download transmit data output UART0_TX: transmit data output SDIO_DATA3: data
7	D5V	Power VBAT	power supply



7 Physical Dimensions



## 8 General Specification

Model	LCWB-009
Product Name	WLAN 802.11b/g/n UART 1T1R + BLE 5.2 module
Major Chipset	BK7234
Standard	802.11 b/g/n
WiFi Interface	UART
Supply Voltage	DC5V OR DC3.3V
Operating Temperature	-30° C ~ 85° C
Storage Temperature	-40° C ~ 85°C
Humidity	5% to 90% maximum
ESD Protection	Contact: $\pm$ 4KV, Air: $\pm$ 8KV; Condition test report, Contact: $\pm$ 30KV, Air: $\pm$ 30KV.
Dimension	25.0x15.0x2.7mm (LxWxH) $\pm$ 0.2mm

## 9 Product Specifications

### 9.1 Electrical Specifications

#### 9.1.1 Absolute Maximum Ratings

Description	Min.	Ttyp	Max.	Unit
Storage Temperature	-40		+85	°C
Storage Humidity (40°C)	5		90	%

#### 9.1.2 Operating conditions

Description	Min.	Typ	Max.	Unit
Supply Voltage	3		5.5	Vdc
Ambient Temperature	-30		+85	°C
Ambient Humidity (40°C)	5		90	%

#### 9.1.3 ESD spec

ESD	Unit
Air discharge	$\pm$ 8KV
Contact discharge	$\pm$ 4KV

## 9.1.4 Current Consumption (Wi-Fi)

### 9.1.4.1 When, Supply voltage = 5V

Parameter	Condition	Min	Typ	Max	unit
Active Mode					
RX current	11b: 11 Mbps DSSS	-	21	-	mA
	11g: 54 Mbps OFDM	-	21	-	mA
	11n: MCS7, HT20	-	21	-	mA
TX current	11b: 11 Mbps DSSS @ 19 dBm	-	235	-	mA
	11g: 54 Mbps OFDM @ 17 dBm	-	200	-	mA
	11n: MCS7, HT20 @ 16 dBm	-	189	-	mA
Sleep Mode					
Sleep	Supply Voltage = 5 V	-	236	-	μA
Shutdown	Supply Voltage = 5 V	-	20	-	μA

### 9.1.4.2 When, Supply voltage = 3.3V

Parameter	Condition	Min	Typ	Max	unit
Active Mode					
RX current	11b: 11 Mbps DSSS	-	27	-	mA
	11g: 54 Mbps OFDM	-	27	-	mA
	11n: MCS7, HT20	-	27	-	mA
TX current	11b: 11 Mbps DSSS @ 19 dBm	-	250	-	mA
	11g: 54 Mbps OFDM @ 17 dBm	-	215	-	mA
	11n: MCS7, HT20 @ 16 dBm	-	205	-	mA
Sleep Mode					
Sleep	Supply Voltage = 3.3 V	-	220	-	μA
Shutdown	Supply Voltage = 3.3 V	-	20	-	μA

### 9.1.5 Current Consumption (BLE)

#### 9.1.5.1 When, Supply voltage = 5V

Device state	Code rate	Output power	Min	Typ	Max	unit
ON_Transmit	1 Mbps	3.5dBm	-	104	-	mA

#### 9.1.5.2 When, Supply voltage = 3.3V

Device state	Code rate	Output power	Min	Typ	Max	unit
ON_Transmit	1 Mbps	3.5dBm	-	110	-	mA

## 9.2 Standard Rated Specification

Radio performance under typical conditions: VDD @5.0V, VD33@3.3V, temp.25°C

### 9.2.1 WIFI

Division	Characteristic
WLAN Standard	IEEE 802.11 b/g/n HT20
Host Interface	UART
Frequency Range	2412MHz ~ 2462MHz
Modulation	802.11b:DSSS,CCK,DPSK,DQPSK
	802.11g/n:OFDM,BPSK,QPSK,16-QAM,64-QAM
Data Rate	802.11b:1,2,5.5,11Mbps
	802.11g:6,9,12,18,24,36,48,54Mbps
Data Rate (20MHz)	802.11n:MCS0,MCS1,MCS2,MCS3,MCS4,MCS5,MCS6,MCS7

### 9.2.2 BLE

<b>Frequency Range</b>	2402MHz ~ 2480MHz	
<b>Spread Spectrum</b>	FHSS (Frequency Hopping Spread Spectrum)	
<b>Modulation</b>	GFSK (Gaussian Frequency Shift Keying)	
<b>Data Rate</b>	1 Mbps	

## 10 RF Specifications

### 10.1 RF Characteristics for Wi-Fi

Feature	Description	
<b>WLAN Standard</b>	IEEE 802.11b/g/n WiFi compliant	
<b>Frequency Range</b>	2412MHz ~ 2462MHz (2.4 GHz ISM Band)	
<b>Number of Channels</b>	2.4GHz : Ch1 ~ Ch11	
<b>Modulation</b>	802.11b : DQPSK, DBPSK, CCK 802.11 g/n : OFDM /64-QAM,16-QAM, QPSK, BPSK	
<b>Output Power</b>	802.11b / 1Mbps : 17dBm $\pm$ 2 dB @ EVM $\leq$ -10dB 802.11b /11Mbps : 17dBm $\pm$ 2 dB @ EVM $\leq$ -15dB	
	802.11g / 6Mbps : 17dBm $\pm$ 2 dB @ EVM $\leq$ -5dB 802.11g /54Mbps : 15 dBm $\pm$ 2 dB @ EVM $\leq$ -28dB	
	802.11n /MCS0	: 16 dBm $\pm$ 2 dB @ EVM $\leq$ -5dB
	802.11n /MCS7	: 14 dBm $\pm$ 2 dB @ EVM $\leq$ -30dB
<b>Receive Sensitivity (11b,20MHz) @8% PER</b>	- 1Mbps	PER @ -93 dBm, typical
	- 2Mbps	PER @ -90 dBm, typical
	- 5.5Mbps	PER @ -88 dBm, typical
	- 11Mbps	PER @ -85 dBm, typical
<b>Receive Sensitivity (11g,20MHz) @10% PER</b>	- 6Mbps	PER @ -91 dBm, typical
	- 9Mbps	PER @ -89 dBm, typical
	- 12Mbps	PER @ -86 dBm, typical
	- 18Mbps	PER @ -83 dBm, typical
	- 24Mbps	PER @ -80 dBm, typical
	- 36Mbps	PER @ -77 dBm, typical
	- 48Mbps	PER @ -74 dBm, typical
	- 54Mbps	PER @ -72 dBm, typical
<b>Receive Sensitivity (11n,20MHz) @10% PER</b>	- MCS=0	PER @ -90 dBm, typical
	- MCS=1	PER @ -87 dBm, typical
	- MCS=2	PER @ -84 dBm, typical
	- MCS=3	PER @ -81 dBm, typical
	- MCS=4	PER @ -78 dBm, typical

	-	MCS=5	PER @ -75 dBm, typical
	-	MCS=6	PER @ -72 dBm, typical
	-	MCS=7	PER @ -70 dBm, typical

## 10.2 RF Characteristics for BLE

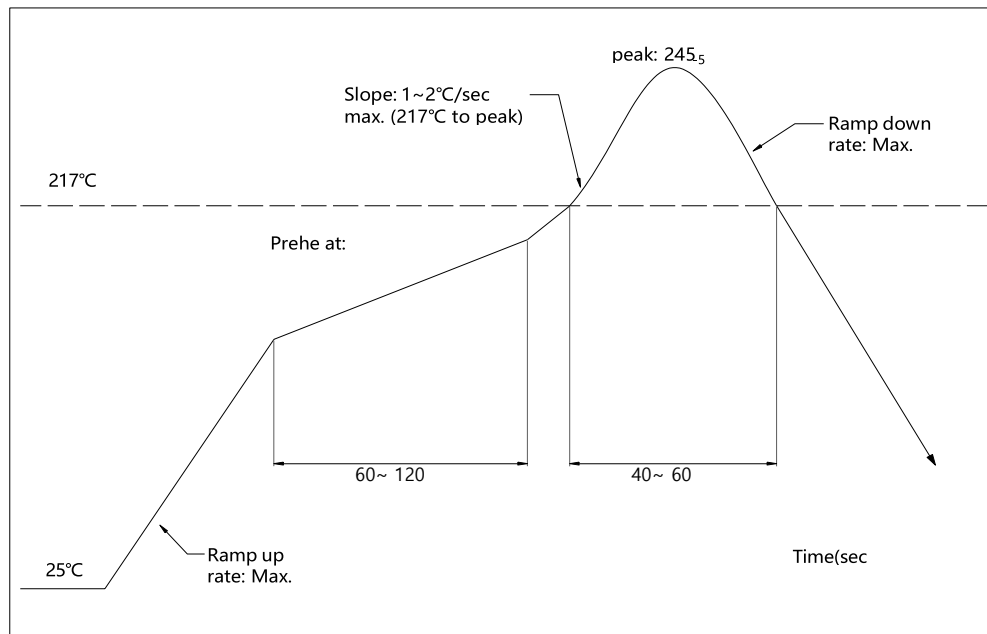
<b>Wireless Standard</b>	Bluetooth® V5.2 specification
<b>Frequency Band</b>	2402~2480 MHz
<b>RF TX Output Power</b>	6dBm ± 1 dB
<b>RX Sensitivity</b>	-95dBm (typical)

## 11 Recommended Reflow Profile

Referred IPC/JEDEC standard.

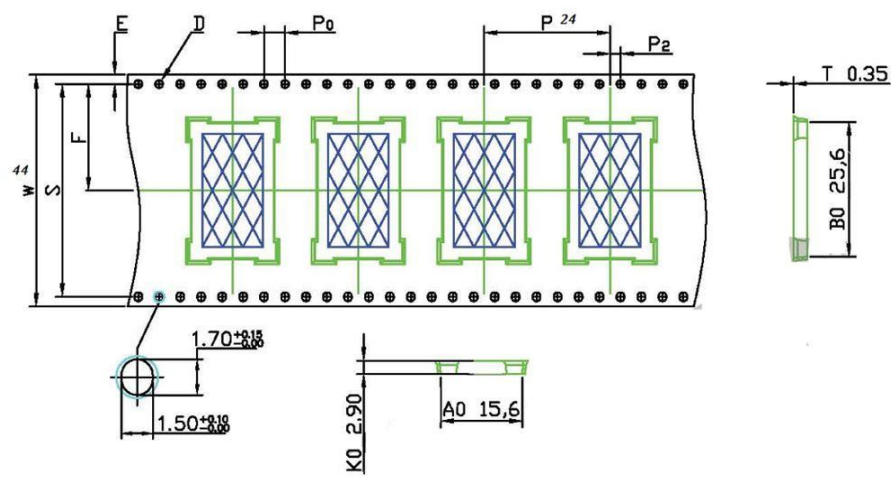
Peak Temperature :  $<250^{\circ}\text{C}$

Number of Times :  $\leq 2$  times



## 12 Packing information

### 12.1 Carrier size Detail:



## 13 FCC Statement

### 13.1 FCC Part 15.19 Statements:

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.

### 13.2 FCC Part 15.105 statement(Class B)

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.

### 13.3 FCC Part 15.21 statement

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.



**<Regulatory notice to host manufacturer according to KDB 996369 D03 OEM Manual v01 >**

**List of applicable FCC rules**

This module has been granted modular approval as below listed FCC rule parts.

-FCC Rule parts **15C(15.247)**

**Summarize the specific operational use conditions**

-The OEM integrator should use equivalent antennas which is the same type and equal or less gain than an antenna listed below this instruction manual.

**Limited module procedures (N/A)**

Single Module

**Trace antenna designs (N/A)**

If trace antenna designs are applicable, full-detail design specifications are required per D02 Module Q&A Question 11.

For a modular transmitter with trace antenna designs, see the guidance in Question 11 of KDB Publication 996369 D02 FAQ –Modules for Micro-Strip Antennas and traces. The integration information shall include for the TCB review the integration instructions for the following aspects: layout of trace design, parts list (BOM), antenna, connectors, and isolation requirements.

- a) Information that includes permitted variances (e.g., trace boundary limits, thickness, length, width, shape(s), dielectric constant, and impedance as applicable for each type of antenna);
- b) Each design shall be considered a different type (e.g., antenna length in multiple(s) of frequency, the wavelength, and antenna shape (traces in phase) can affect antenna gain and must be considered);
- c) The parameters shall be provided in a manner permitting host manufacturers to design the printed circuit (PC) board layout;
- d) Appropriate parts by manufacturer and specifications;
- e) Test procedures for design verification; and
- f) Production test procedures for ensuring compliance.

## RF exposure considerations

The module has been certified for integration into products only by OEM integrators under the following condition:

- The antenna(s) must be installed such that a minimum separation distance of at least **50mm** is maintained between the radiator (antenna) and all persons at all times.
- The transmitter module must not be co-located or operating in conjunction with any other antenna or transmitter except in accordance with FCC multi-transmitter product procedures.

### -portable use

As long as the three conditions above are met, further transmitter testing will not be required. OEM integrators should provide the minimum separation distance to end users in their end-product manuals.

- This module is exclusively for LG Electronics' finished products.
- If the host device equipped with this module does not meet the **50mm** separation distance requirement, additional certification will be conducted.
- \* Host device examples: washing machines, air conditioners, refrigerators, ovens, vacuum cleaners, etc.

## Antennas

This module is certified with the following integrated antenna.

- Ant. Type: PCB Pattern Antenna (Max. Antenna gain: -1.05 dBi )

Any new antenna type, higher gain than listed antennas should be met the requirements of FCC rule 15.203 and 2.1043 as permissive change procedure

## Label and compliance information

### End Product Labeling (FCC)

The module is labeled with its own FCC ID. If the FCC ID is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. In that case, the final end product must be labeled in a visible area with the following:

- \* **Contains FCC ID:** BEJ-LCWB009

## Information on test modes and additional testing requirements

- OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed. (for example, digital device emissions, PC peripheral requirements, additional transmitter in the host, etc.).

**Additional testing, Part 15 Subpart B disclaimer**

The grantee should include a statement that the 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.

**Note EMI Considerations**

Note that a host manufacture is recommended to use D04 Module Integration Guide recommending as "best practice" RF design engineering testing and evaluation in case non-linear interactions generate additional non-compliant limits due to module placement to host components or properties. For standalone mode, reference the guidance in D04 Module Integration Guide and for simultaneous mode; see D02 Module Q&A Question 12, which permits the host manufacturer to confirm compliance.

**How to make changes**

Since only Grantees are permitted to make permissive changes, when the module will be used differently than granted, please contact the module manufacture on below contact information.

-. Contact information: [younguk.nam@lge.com](mailto:younguk.nam@lge.com) / Tel: 82-31-8066-5539

**Responsible Party Information**

-. Model name : LCWB-009

-. Responsible Party U.S. Contact Information : LG ELECTRONICS CANADA INC.

(Name) David Kim

(Phone number) 201-470-2696

(Address) 111 Sylvan Avenue, North Building, Englewood Cliffs, New Jersey 07632, United States

## 14. ISED Statement

### 14.1 Licensed-exempt Statement

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s).

Operation is subject to the following two conditions:

1. This device may not cause interference.
2. This device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

- (1) l'appareil ne doit pas produire de brouillage, et
- (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

## 14.2 RF Exposure Statement

The antenna(s) must be installed such that a minimum separation distance of at least **50mm** is maintained between the radiator (antenna) and all persons at all times.

L'exposition aux RF L'antenne (ou les antennes) doit être installée de façon à maintenir à tout instant une distance minimum de au moins **50mm** entre la source de radiation (l'antenne) et toute personne physique.

## 14.3 End Product Labeling

The module is labeled with its own IC Certification Number. If the IC Certification Number are not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. In that case, the final end product must be labeled in a visible area with the following:

**Contains IC: 2703N-LCWB009**

Étiquetage du produit final (IC)

Le module est étiqueté avec sa propre identification FCC et son propre numéro de certification IC. Si l'identification FCC et le numéro de certification IC ne sont pas visibles lorsque le module est installé à l'intérieur d'un autre dispositif, la partie externe du dispositif dans lequel le module est installé devra également présenter une étiquette faisant référence au module inclus. Dans ce cas, le produit final devra être étiqueté sur une zone visible avec les informations suivantes :

**Contient module émetteur IC : 2703N-LCWB009**