FCL Components Wireless modules

Wirepas Mesh 2.4 GHz Ultra-Slim Tag

FWM8BLZ14T Datasheet

Ver. 3
Feb. 1, 2024

FCL Components Limited

All specifications are preliminary which may be changed without any prior notice

Table of Contents

1. Summary

This datasheet applies to the Wirepas Mesh 2.4 GHz based Ultra-Slim Tag FWM8BLZ14T.

2. Features

This product is an antenna integrated Ultra-Slim Tag which incorporates Wirepas Mesh 2.4 GHz. It is possible to communicate in 2.4 GHz ISM (Industrial Scientific Medical) band. Since Wirepas Mesh is a wireless mesh network technology, it enables wireless IoT networking at massive scale mainly used for asset tracking.
The followings are the key features.

- Wirepas Mesh 2.4 GHz enabled
- Dimension : 52.8mm x 35.9mm x 5.8mm
- Weight : 15.0g (with battery)
- Operating Temperature : -30 to +70 °C
- Operating Humidity : +20 to +80 %RH (Noncondensing)
- Water resistant and dustproof : IP67
- Power Supply : CR3032 battery (replaceable)

Functions:
- Tag for positioning application
- LED indicator (RED)
- Push Button
- Configurable by App config message or Remote API.
- Battery voltage level monitoring

3. Applicable Standard

- Wirepas Mesh 2.4 GHz, v5.3
- FCC, ISED certification

    FWM8BLZ14T contains the certified module (FWM7BLZ20B).

    FCC ID of the certified module: SQK-7BLZ20

    ISED ID of the certified module: 337L-7BLZ20

- CE, UKCA Marking
- ARIB STD-T66
- Radio Act (Japan) Certification No. 007-AG0232

    (Certificated by the combination of embedded module.)

- RCM, R-NZ certification
- RoHS Compliant

4. Block Diagram
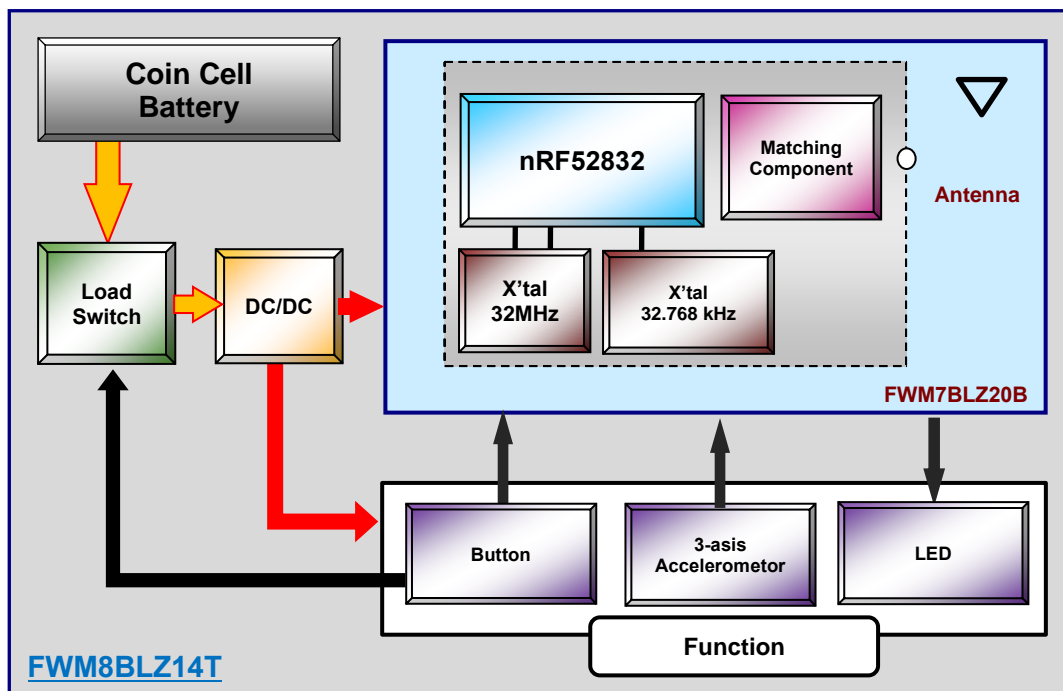
Figure 4-1: Block Diagram

5. Electrical Characteristics

5-1. General Features

Wirepas Mesh 2.4 GHz enabled

Carrier frequency:	2400 MHz to 2483.5 MHz
Modulation:	GFSK
On-air Data Rate:	1 Mbps
Modulation index:	0.5
Channel:	40 RF channels
Channel spacing:	2 MHz
Output power:	+4 dBm Max

5-2. Absolute Maximum Rating

Items	Symbol	Min	Max	Unit
Supply Voltage (VDD)	VDD	-0.3	3.6	V
Supply Voltage (GND)	GND		0	V
Storage Temperature	Tstg	-30	+70	°C
Acceleration (Any axis)			20,000 g for 0.2msec	

5-3. Recommended Operating Condition

Items	Symbol	Min	Typ.	Max	Unit
Operating Voltage (VDD)	VDD	2.5	3.0	3.3	V
Operating Temperature	Ta	-30	25	+70	°C
Operating Humidity*	Hopr	20	-	80	%RH

*No dew condensation

5-4. General radio characteristics

Ta=25±2°C

Items	Condition	Min	Typ.	Max	Unit
Operating frequencies	2MHz channel spacing	2400	-	2483.5	MHz
PLL programming resolution			2		kHz
PLL channel spacing			1		MHz
Frequency deviation			±250		kHz

5-5. Transmitter Specifications

Ta=-30°C to 70°C

Items	Condition	Min	Typ.	Max	Unit
Output power		-20		+4	dBm
Step size of RF power control			4		dB
RF power control range			+24		dB

5-6. Receiver specifications

Ta=-30°C to 70°C

Items	Condition	Min	Typ.	Max	Unit
Maximum received signal strength	< 30.8% PER		0		dBm
Receiver sensitivity	Dirty transmitter < 30.8% PER		-94		dBm

Items	Condition	Min	Typ.	Max	Unit
RX selectivity (C/I performance)	Co-channel interference		6		dB
	Adjacent (-1 MHz) interference		-2		dB
	Adjacent (+1 MHz) interference		-9		dB
	Adjacent (-2 MHz) interference		-22		dB
	Adjacent (+2 MHz) interference		-46		dB
	Adjacent (>= 3 MHz) interference		-50		dB
	Image frequency interference		-22		dB
	Adjacent (1 MHz) interference to in-band image frequency		-35		dB
RX intermodulation	IMD performance (3 MHz, 4 MHz, and 5 MHz offset)		-30		dBm

5-7. Current Consumption

5-7-1. Current consumption of RF part

VDD=3.0V,Ta=25±2°C

Description	Symbol	Typ.	Max.	Unit
TX current @ P_{OUT} = +4 dBm	$I_{TX,+4dBM}$	9.5	16.0	mA
TX current @ P_{OUT} = 0 dBm	$I_{TX,0dBM}$	8.0	12.0	mA
TX current @ P_{OUT} = -4 dBm	$I_{TX,-4dBM}$	7.3	11.0	mA
TX current @ P_{OUT} = -8 dBm	$I_{TX,-8dBM}$	7.0	10.0	mA
TX current @ P_{OUT} = -12 dBm	$I_{TX,-12dBM}$	6.8	9.5	mA
TX current @ P_{OUT} = -16 dBm	$I_{TX,-16dBM}$	6.6	9.0	mA
RX current	I_{RX}	10.0	16.3	mA
Deep Sleep current	I_{SLEEP}	30		uA

5-7-2. Average current consumption of Sensor (reference value)

Ta=25±2°C

Description	Symbol	Typ.	Max.	Unit
3-axis Acceleration		35		uA

5-8. 3-axis Acceleration sensor

Items	Symbol	Min	Typ	Max	Unit
ACCELEROMETER SENSITIVITY					
Full-Scale Range		0		±16	G
Output resolution			0.001		G

The 3-axis acceleration sensor is only used to wake up the unit from sleep mode by shock detection. Therefore, the sensor will output nothing. For the details about accelerometer shock detection and the data calculation method, please refer to the "Wirepas Mesh Sensor Unit Firmware Specification".

6.   Interface specifications
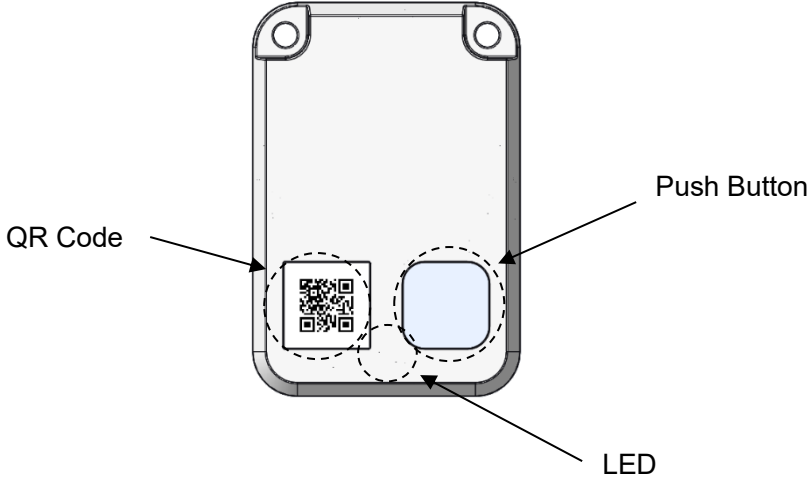
6-1.   Hardware Interface

Figure 6-1: Hardware Interface

7. Function Specification

7-1. Operation Mode

This product has two types of operation modes shown in the table below, and the modes can be switched by operating the button at startup.

Operation Mode	Description
Mode 1 (Normal Mode)	This mode is intended for use in normal operation.
Mode 3 (Recovery Mode)	Delete all settings and restore the default firmware.

Various operation settings of this product can be changed.

Settings can be changed using the Wirepas Terminal or Wirepas Network Tool.

(Settings can also be changed using the AppConfig function or Remote API.)

7-1-1. Mode 1 (Normal mode)

7-1-1-1. Power ON

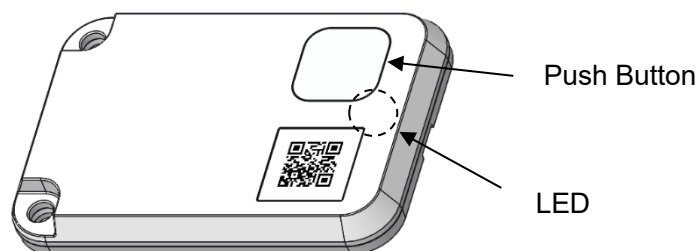| Operating Instructions	Push Button	LED
Press the push button and hold for about 4 seconds when battery is connected.	ON	OFF
		Blinking (2s, interval 100ms)
Release the button when the LED starts blinking.	OFF	OFF

Figure 7-1-1-1: Power ON

Behavior of Power ON

When the unit is turned on, the LED indicator blinks for 2 seconds and then turns off.

This LED blinking behavior can't be changed.

7-1-1-2. **LED Blinking**

Operating Instructions	Push Button	LED
Press the push button for 0.1sec ~5sec when the device is powered ON.	ON	Blinking (0.5s, interval 50ms)
	OFF	OFF

Behavior of LED Blinking

By this operation, "**BUTTON_PRESSED!**" event will be notified
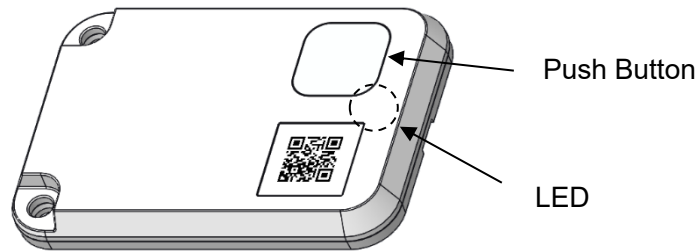
Figure 7-1-1-1: Power ON

7-1-1-3. **Power OFF**

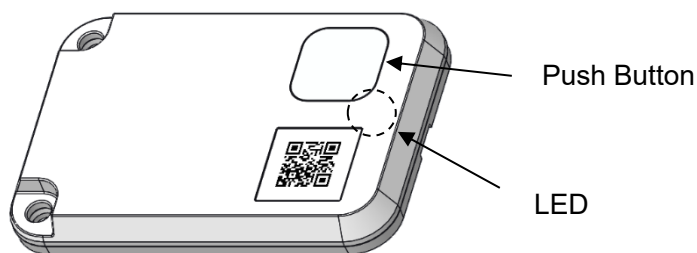| Operating Instructions	Push Button	LED
Press the push button and hold for about 6 seconds. Release the button when the LED starts blinking	ON (hold 6s)	OFF
		Blink 2s, interval 500ms Blink 0.8s, interval 200ms
	OFF	OFF

Figure 7-1-1-3: Power OFF

7-1-2. Mode 3 (Recovery mode)

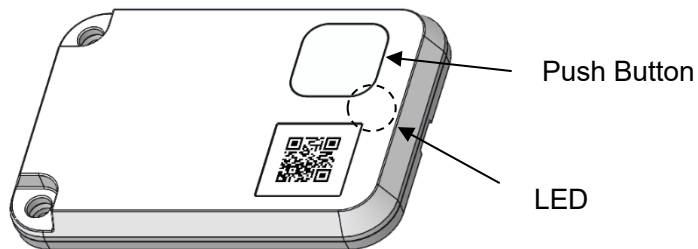| Operating Instructions	Push Button	LED
Press and hold push button until the LED starts blinking for the second time. The LED operation sequence is described at right.	ON	OFF
		Blinking 2s, interval 100ms
		OFF 20s
		ON 3s
		OFF 10s
		Blinking 5s, interval 100ms
Release the button within 5seconds when the LED starts blinking for the second time.	OFF	

Figure 7-1-2: Mode 3 (Recovery Mode)

Behavior of Mode 3

The recovery mode is a function that aims to forcibly restore it to the initial settings when it is out of control due to a reason such as "Inappropriate settings are done to the product".

This deletes all the settings and restore the firmware to initial settings. It reboots automatically after the recovery.

8. Firmware

8-1. Firmware version

Version *	Firmware version (Base version of Wirepas firmware is given in parenthesis).	App_version	App_specific_area_id
AA			
BA	wp_v1.00D_v5_00	1.0.0.0	0xFC1141
CA			
CB	wp_v2.00D_v5_00	2.0.0.0	

* Please refer to 9-2 Label specification.

8-2. Initial setting

Customer Setting	Value
Firmware_Version	v2.00D_v5_00
Wirepas_Mesh_version	5.3.0.89
app_specific_area_id	0xFC1141
app_version	2.0.0.0

Item	Value
AUTHENTICATION_KEY_EN	0 (disable)
ENCRIPTION_KEY_EN	0 (disable)
NETWORK_ADDRESS	7986085 (0x79DBA5)
NETWORK_CHANNNEL	10
EP_BASE_NUM	0x06
PRODUCT_MODE	FWM8BLZ14T
POS_NODE_ROLE	0x02 (Non-router | Low Energy)
POS_OPERATION_MODE	0x01 (NRLS_TAG)
POS_DEVICE_CLASS	0xFA
POS_NRLS_MAX_SLEEP_TIME	0x03 (15 minutes)
POS_NRLS_MAX_RUN_TIME	0x01 (1minute)
POS_MEASUREMENT_RATE	0x003C (60 seconds)
POS_ACCEL_THRESHOLD	0x60
POS_BATT	0 (Disable)
ADV_EN	0 (Disable)
ADV_DATA_SEL	1 (Fixed_Data)
FIXED_ADV_DATA_SEL	1 (iBeacon)
ADV_INT	0x0A (1 second)
DATA_QOS	0 (Nomal)
COMMAND_QOS	0 (Nomal)
ACC_DISABLE_TIME	0x06 (60 seconds)

If you turn on the product in mode 3 of section 7-1-2, all the settings will be initialized to above settings.
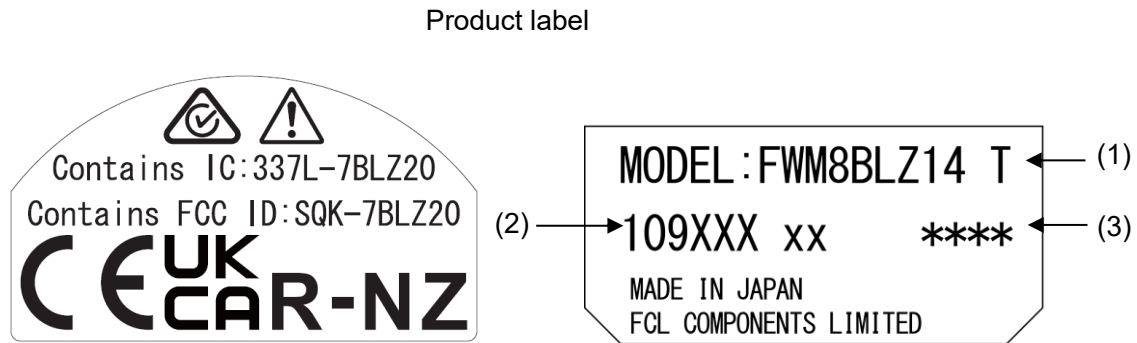
9. Mechanical Characteristics
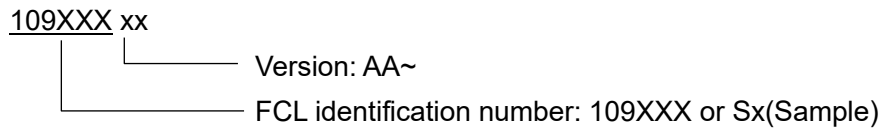
9-1. Appearance and Dimensions
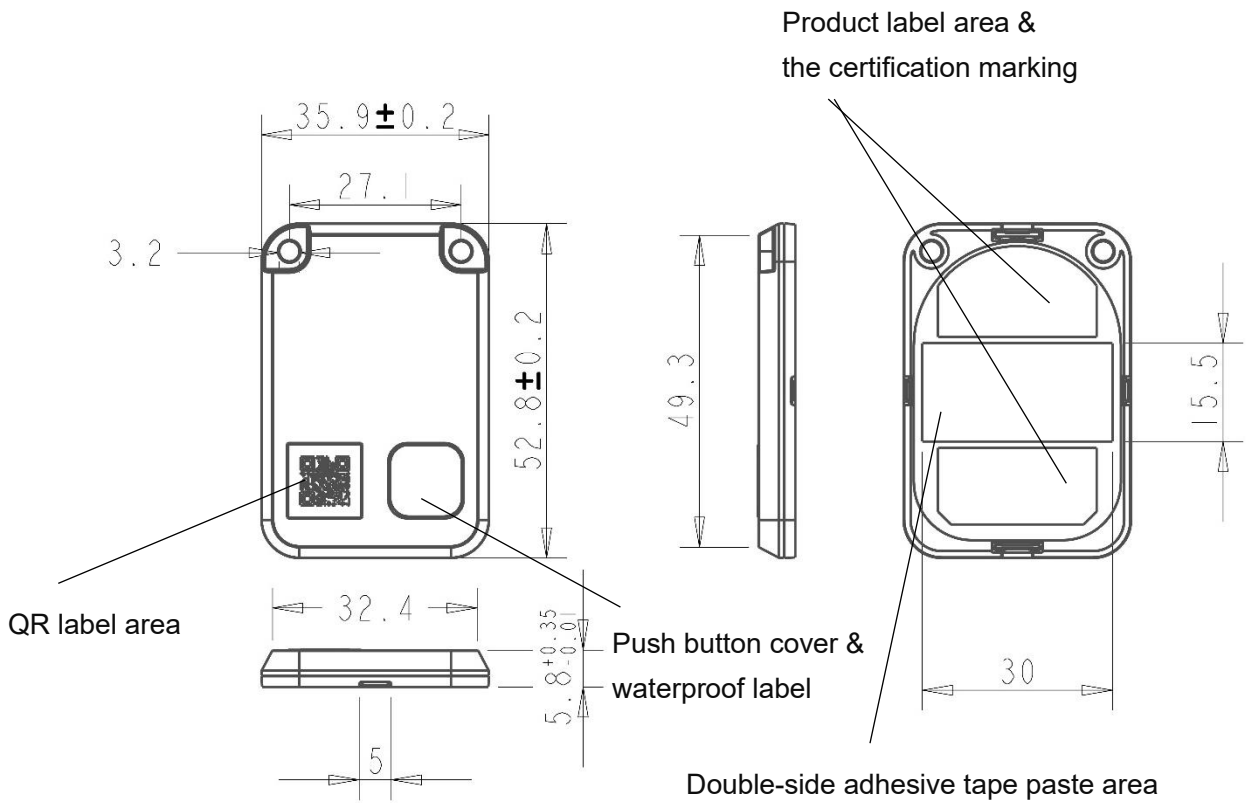
Unit [mm]

Figure 9-1: Appearance and Dimensions

9-2. Stamping label specification

Product label

(1) FCL Identification Number + Identification symbol: FWM8BLZ14 + T

(2) FCL Identification Number, Version number:

<u>109XXX</u> xx

                Version: AA~

                FCL identification number: 109XXX or Sx(Sample)

(3) Lot Number:

* * **

                Serial Number: 00 ~

                Month: 1-9, X, Y, Z
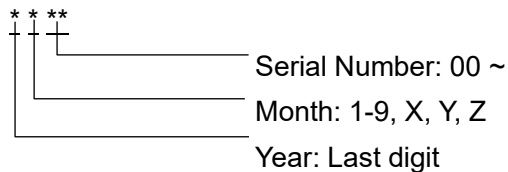
                Year: Last digit

Figure 9-2: Stamping Label

10. Storage Conditions

- Do not store this product in the environments exposed to shock or vibration. It may result in damage, malfunction, or deterioration of quality.
- Do not throw or drop cartons containing this product during transportation. It may result in damage, malfunction, or deterioration of quality.

11. Warranty period

The warranty period for this product is 18 months after the product is shipped from us.

Note 1: We can not provide any warranty for the operation of this product in all vibrating condition. Please check in your own environment before use.

Note 2: We can not provide any warranty for battery lifetime during shipment as the storage and operating condition vary according to the usage.

Note 3: We will provide warrenty for maximum 5 times battery replacement for this product.

Note 4: Please make sure that the product is not wet while opening and closing the case.

Note 5: If the product is dropped while using, please check the LED blinking operation by pressing the push button. If there is no LED blinking, restart the device as mentioned in "Mode 1 Power ON (7-1-1-1)"

12. Battery replacement

Recommended CR3032: Made by Panasonic or PowerGlory

1. Push a spatula with a tip of about 0.1 mm into the case gap and push the upper case upward. Please use the spatula made of nylon, carbon, or the like. Use of a metal spatula may damage the product.
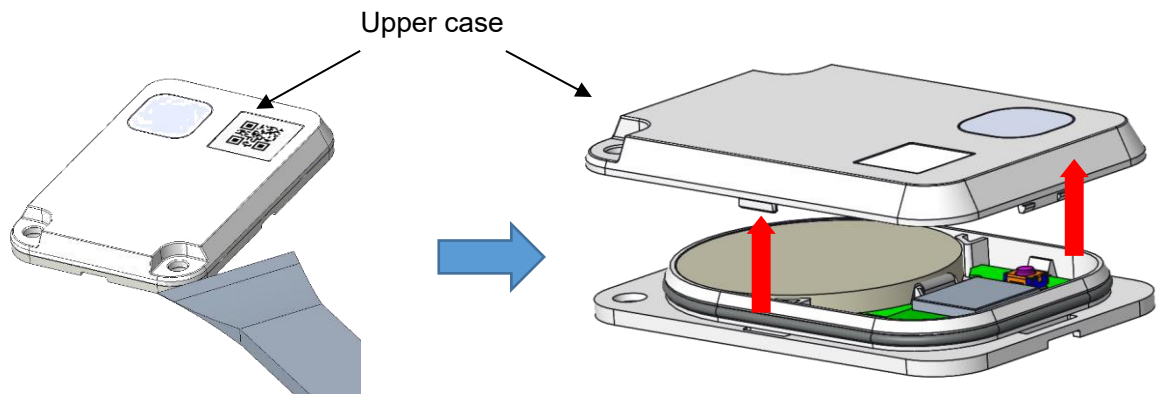
Upper case

Figure12-1: Step1

2. Replace the coin battery as shown below. Please insert the battery horizontally or diagonally with + sign facing up into the case.
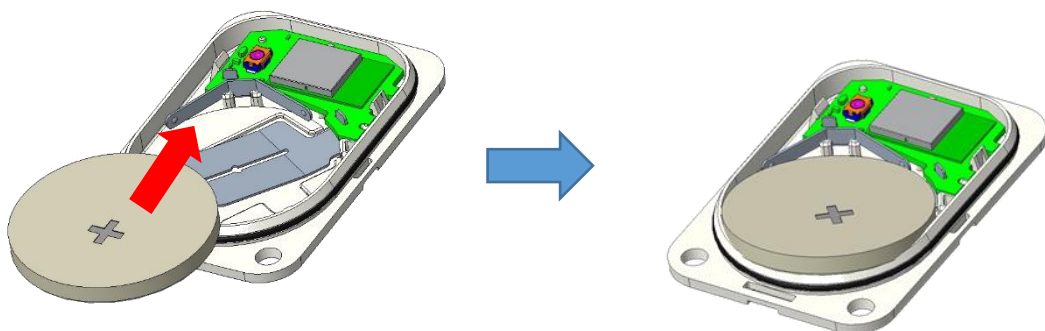
Figure 12-2: Step 2

3. Align the clip on the button side of the upper case with the hole in the lower case and press, then close the battery side.
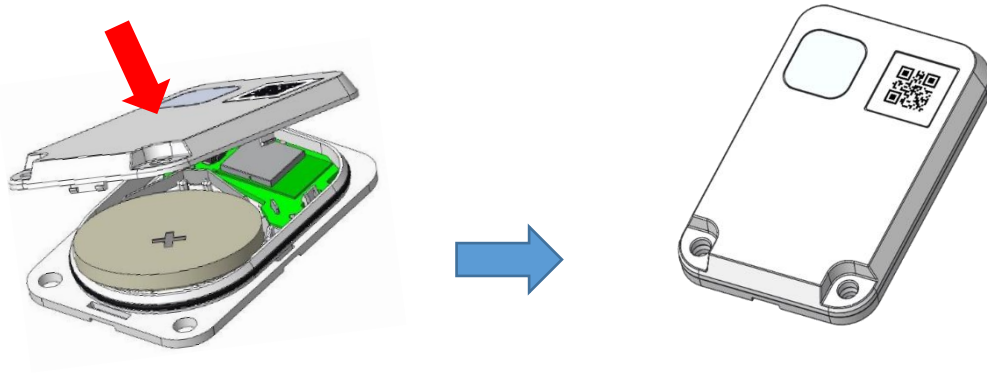
Figure 12-3: Step 3

Note：

・Please use only CR3032 type coin battery. Other type of batteries will damage the device.

・When opening the upper case, please be careful not to exchange the upper cases among devices because the QR code attached on the upper case contains the unique information of the device.

13. Packing Specification

13-1. Label
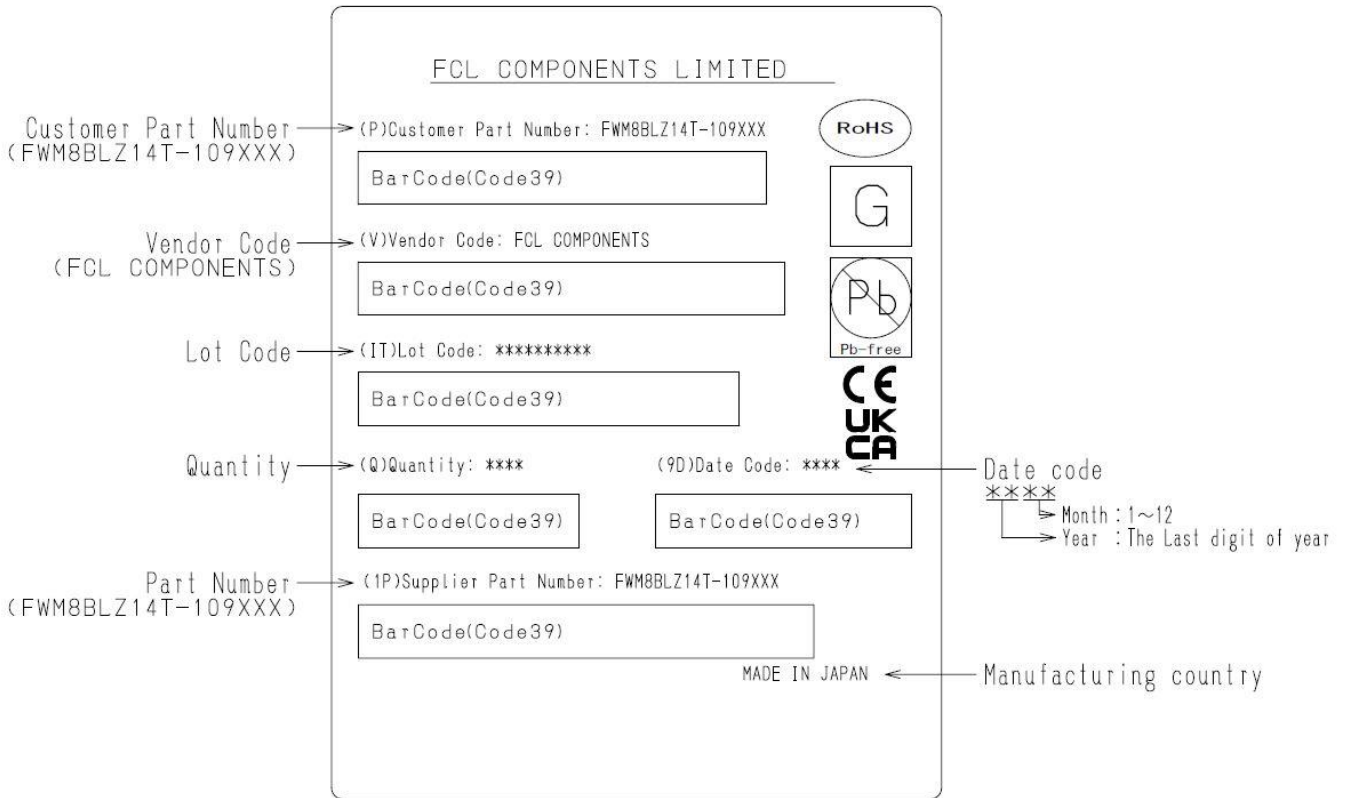
Figure 13-1: Label

13-2. Shipment Packing

13-2-1. Shipping package

Packing Bag

10 pcs

Inner Box

Partition board

Quick guide

Inner Box
(10 boxes)

Partition board

Inner Box
(10 boxes)

Partition board
(2 sheet)

Outer Box
(200 pcs max)

Label

Figure 13-2-1: Shipment Package

14. Caution

14-1. Firmware

・ FCL Components Limited ("FCL") may update the firmware without prior notice.
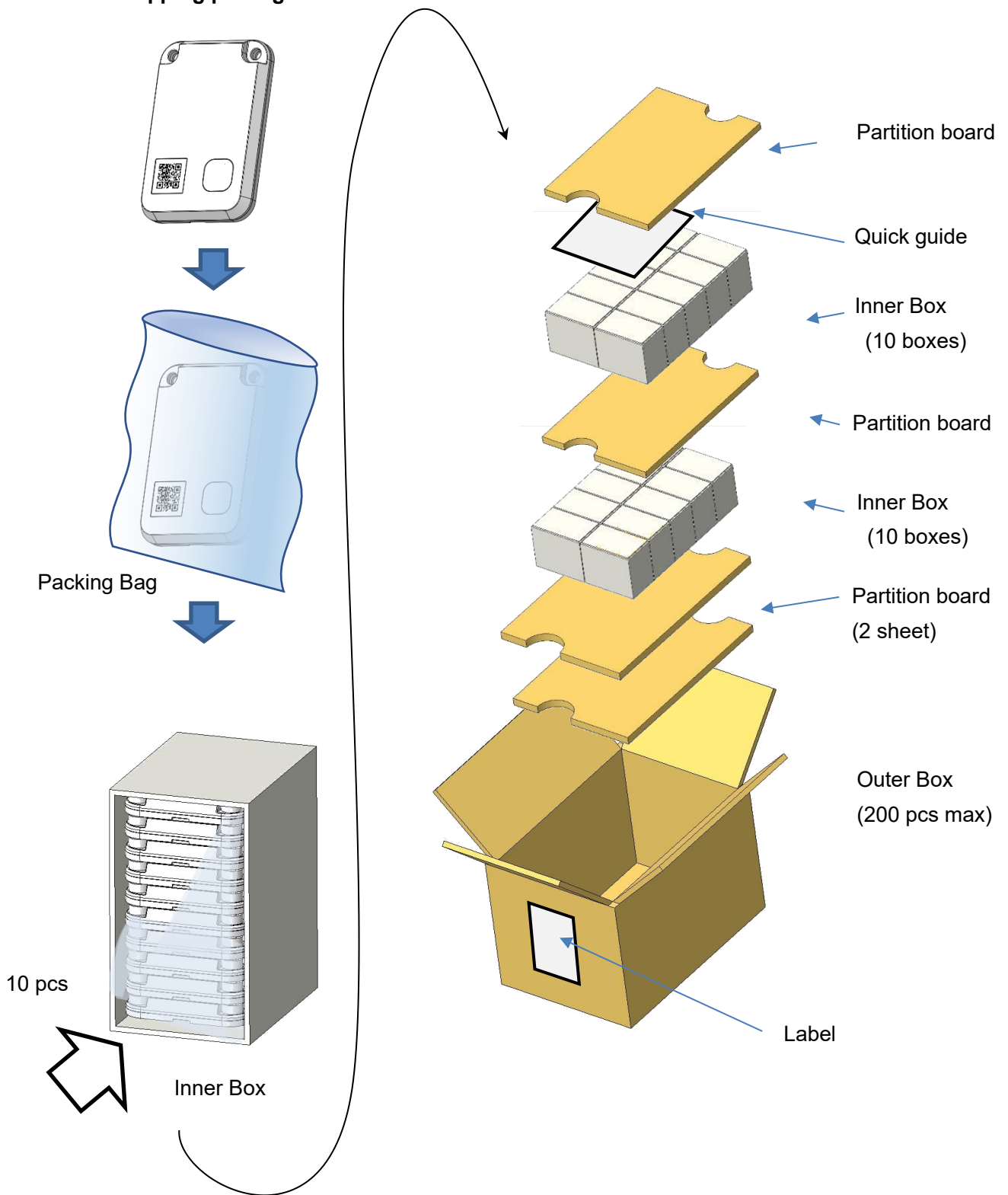
・ FCL does not provide the firmware update to the products already delivered to customer.
    If you hope to continuously use the prior version of firmware, please contact your nearest
    FCL Components's sales office.

14-2. Lithium Battery

Lithium coin cell battery is used in this unit, please be aware of following items.

・ RISK OF EXPLOSION IF BATTERY IS REPLACED BY AN INCORRECT TYPE.

・ RISK OF EXPLOSION OR THE LEAKING FLAMMABLE LIQUID OR GAS IF
    FOLLOWING IS APPLIED.
    ➢ Replaced by incorrect battery type.
    ➢ Dispose to a heated furnace or incinerator.
    ➢ Leaving at excessively high and low temperature condition.
    ➢ Leaving at excessive low pressure.
    ➢ Mechanical stress such as crushing, puncturing or cutting.

・ Disposal of used batteries must follow the instruction or rules of the regional authority.

⚠ ・ This product contains a coin cell battery. If the coin cell battery is swallowed, it can cause
    severe internal burns in just 2 hours and can lead to death.

⚠ ・ Keep new and used batteries away from children.
    If the battery compartment does not close securely, supper using the product and keep it
    away from children.
    If you think batteries might have been swallowed or placed inside any part of the body,
    seek immediate medical attention.

15. Compliance Statement

Note to users in the United States of America
Caution:
Changes or modifications not expressly approved by the party responsible for
compliance could void the user's authority to operate the equipment.
Declaration of Conformity
This device complies with part 15 of 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 to users in the United States of America and Canada
Note to users
It is strictly forbidden to use antenna except designated.
This equipment must not be co-located or operated in conjunction with any other antenna or
   transmitter.

This equipment complies with FCC/IC radiation exposure limits set forth for an
uncontrolled environment and meets the FCC radio frequency (RF) Exposure Guidelines
and RSS-102 of the IC radio frequency (RF) Exposure rules. This equipment has very low
levels of RF energy that is deemed to comply without testing of specific absorption rate
(SAR).

Note to users in Canada
Cet équipement est conforme aux limites d'exposition aux rayonnements énoncées pour un
environnement non contrôlé et respecte les règles d'exposition aux fréquences radioélectriques
(RF) CNR-102 de l'IC. Cet équipement émet une énergie RF très faible qui est considérée
conforme sans évaluation de l'exposition maximale autorisée.

Note to users in Canada
This device complies with Industry Canada's license-exempt RSSs.
Operation is subject to the following two conditions:
   (1) This device may not cause interference; and
   (2) This device must accept any interference, including interference that may cause
       undesired operation of the device.

Remarque concermant les utilisateurs au Canada

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.

European Community Compliance Statement

Note:

Hereby, FCL Components Limited, declares that this FWM8BLZ14 is in compliance with the essential requirements and other relevant provisions of Directive 2014/53/EU. The full text of the declaration of conformity is available at the following internet address: https://www.fcl-components.com/en/products/wireless-modules/information/documents.html

Hermed erklærer FCL Components Limited, at denne enhed er I overensstemmelse med direktiv 2014/53/EU. EU-overensstemmelseserklæringens fulde tekst kan findes på følgende internetadresse: https://www.fcl-components.com /en/products/wireless-modules/information/documents.html

Note to users in the Great Britain

United Kingdom conformity Assessed Compliance Statement

Note:

Hereby, FCL Components Limited, declares that this FWM8BLZ14 is in compliance with the relevant statutory requirements. The full text of the declaration of conformity is available at the following internet address: https://www.fcl-components.com /en/products/wireless-modules/information/documents.html

16. Version History

Version	Content change	Date
Draft 1	Preliminary release.	December 9, 2022
Draft 2	7-1-1.　Mode1 operation is updated. 7-1-2.　Mode3 operation is updated. 12.　　Battery replacement note is updated. 13.2.1. Label is added 14-2.　The safeguard instructions are added.	February 27,2023
Draft 3	2.　　Change weight to include battery 5-7-1. Current consumption of RF part is modified 8-1.　　The edition is updated 8-2.　Add detail 11.　　Add notes regarding vibration environmental 　　　conditions and battery warranty. 12.　　Change Figure 12-2	September 14, 2023
1	Section 5-2: Correction Section 5-4: Correction Section 5-6: Correction Section 7-1-1-3　Change in product power off method Section 12: Battery replacement note is updated Section 13-2 Change in packaging method	Oct. 16, 2023
2	Section 1: Weight changed Section 7-1-1-3:　Change in product power off method Section 9: Dimension tolerance is added Section 11: Note3~5 is added	Nov.22, 2023
3	Change of Company name	Feb.1, 2024