

FUJITSU Component Wireless module

Bluetooth® Smart Beacon Unit

FWM8BLZ02 Datasheet

Rev. 0.05
OCT 5, 2015

The above Product is designed, developed and manufactured as contemplated for general use, including without limitation, general office use, personal use, household use, and ordinary industrial use, but is not designed, developed and manufactured as contemplated (1)for use accompanying fatal risks or dangers that, unless extremely high safety is secured, could lead directly to death, personal injury, severe physical damage or other loss (i.e., nuclear reaction control in nuclear facility, aircraft flight control, air traffic control, mass transport control, medical life support system, missile launch control in weapon system), or (2)for use requiring extremely high reliability (i.e., submersible repeater and artificial satellite), hereinafter referred to as "High Safety Required Use". You shall not use this Product without securing the sufficient safety or reliability required for the High Safety Required Use. If you wish to use this Product for High Safety Required Use, please consult with our sales representatives in charge before such use.

Fujitsu Component Limited

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

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1. Summary

This datasheet applies to the *Bluetooth*[®] Smart Beacon Unit FWM8BLZ02.

2. Features

This product is an antenna integrated Beacon Unit compliant with *Bluetooth* Specification Version 4.1, and is possible to communicate in an ISM(Industrial Scientific Medical) band. This product conforms to single mode of *Bluetooth* low energy technology, and mainly operates as broadcaster device and transmits advertising information (Beacon information). The followings are the key features.

- *Bluetooth* Specification Version 4.1 (*Bluetooth* Smart Single mode) Compliant
- Dimension: 40.0mm x 31.0mm x 12.0mm
- Weight: 9.4g *without CR2450 coin-cell battery
- Software Interface: Fujitsu Component proprietary commands/events
- Hardware Interface: Push Button, Slide Switch
- Operating Temperature: -30 ~ +60 °C *without CR2450 coin-cell battery
- Operating Humidity : +20 ~ +80 %RH (No dew condensation)
- Power Supply: Coin-cell battery 3V (CR2450: 620mAh)
- Battery life: About two years or more.

*Condition: Advertising interval setting is 1 second (Broadcaster device)

*The battery life is different depending on conditions (Advertising data, Advertising interval etc.).

The followings are functions.

- Transmission of advertising data (Beacon information)
- Operation mode change by handling a button
- Status display by LED indicator
- Changing of settings from central device (wireless)

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3. Applicable Standard

- *Bluetooth* Specification Version 4.1
QDID: 59305
- FCC,IC certification
FCC ID : SQK-7BLZXX
IC ID : 337L-7BLZXX
- CE Marking
- ARIB STD-T66
Radio Act(Japan)Certification No. 007-AB0237
(Certificated by the combination of embedded module.)
- RoHS Compliant

4. Block Diagram

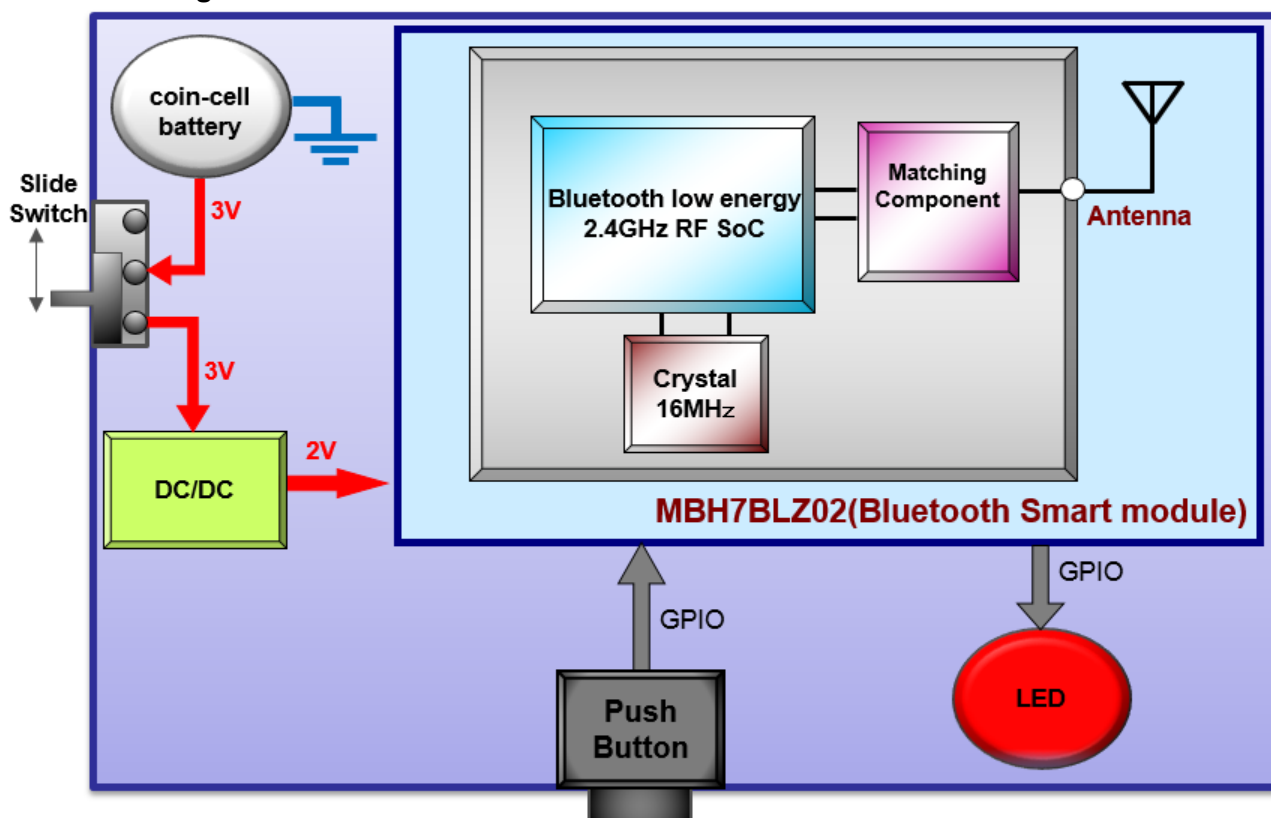


Figure 4-1: Block Diagram

5. Electrical Characteristics

5-1. General Features

Bluetooth Specification Version 4.1 Compliant

Carrier Frequency: 2400 MHz ~ 2483.5 MHz

Modulation: GFSK

Symbol Rate: 1 Mbps

Data Rate: 1 Mbps

Channel: 40 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	6.0	V
Supply voltage (GND)	GND	-	0	V

5-3. Recommendable Operating Condition

Items	Symbol	Min	Typ	Max	Unit
Operating Voltage	VDD	2.4	3.0	3.6	V
Operating Temperature	Ta	-30	25	+60	°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			1		MHz
Frequency deviation		±225	±250	±275	kHz

5-5. Transmitter Specifications

Ta=-30°C~60°C

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

5-6. Receiver sensitivity

Ta=-30°C~60°C

Items	Condition	Min	Typ	Max	Unit
Maximum received signal strength	< 30.8% PER			-10	dBm
Receiver sensitivity	Ideal transmitter < 30.8% PER		-90		dBm
	Dirty transmitter < 30.8% PER		-88		dBm

5-7. Receiver specifications

Ta=25±2°C

Items	Condition	Min	Typ	Max	Unit
RX selectivity	C/I co-channel	-	10	21	dB
	1st ACS, C/I 1 MHz	-	1	15	dB
	2nd ACS, C/I 2 MHz	-	-25	-17	dB
	ACS, C/I (3+n) MHz offset [n = 0, 1, 2, . . .]	-	-51	-27	dB
	Image blocking level	-	-30	-9	dB
	Adjacent channel to image blocking level (±1 MHz)	-	-31	-15	dB
RX intermodulation	IMD performance, 3rd, 4th and 5th offset channel	-50	-39	-	dBm

5-8. Current Consumption

Ta=25±2°C

Description	Symbol	Typ.	Max.	Unit
TX only run current @ P _{OUT} = +4 dBm	I _{TX,+4dBm}	10.9	16.0	mA
TX only run current @ P _{OUT} = 0 dBm	I _{TX,0dBm}	8.0	12.0	mA
TX only run current @ P _{OUT} = -4 dBm	I _{TX,-4dBm}	7.3	11.0	mA
TX only run current @ P _{OUT} = -8 dBm	I _{TX,-8dBm}	6.6	10.0	mA
TX only run current @ P _{OUT} = -12 dBm	I _{TX,-12dBm}	6.3	9.5	mA
TX only run current @ P _{OUT} = -16 dBm	I _{TX,-16dBm}	6.1	9.0	mA
RX current	I _{RX}	11.2	16.3	mA
Deep Sleep current	I _{SLEEP}	5.5		uA

6. Interface specifications

6-1. Software Interface

Refer to the document of “*Bluetooth Smart Beacon (FDC Beacon) Functional, Firmware Specification*”.

6-2. Hardware Interface

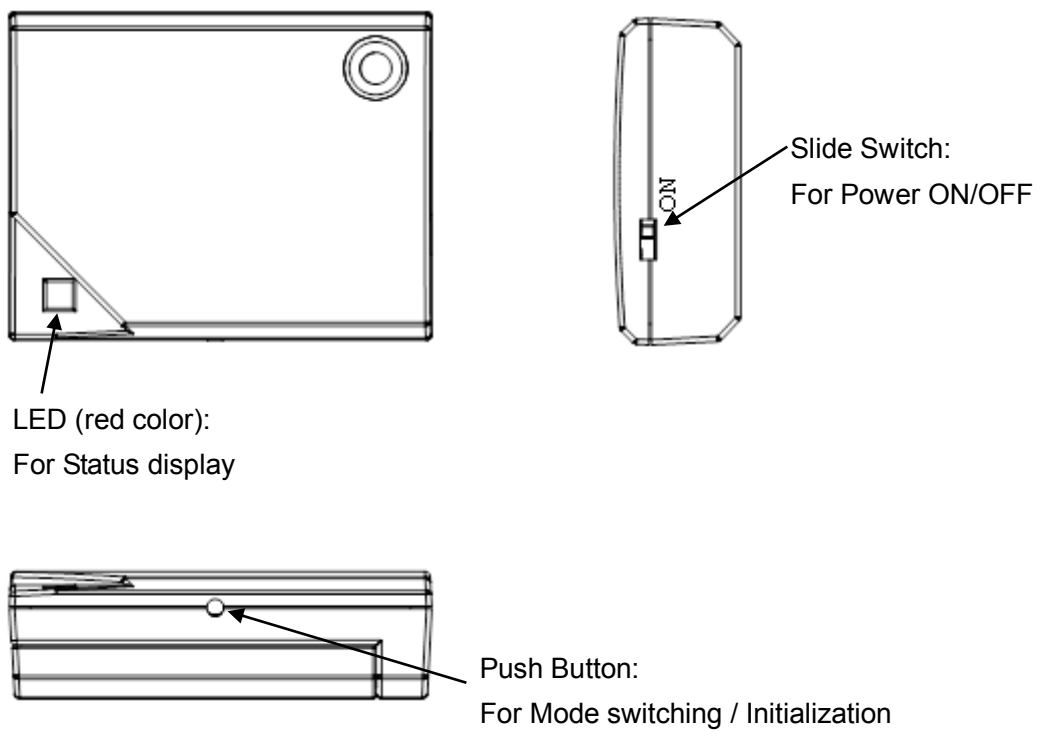


Figure 6-1: Hardware Interface

7. Function Specification

7-1. Operation Mode

This product has three operation modes and user can switch the mode by handling the slide switch and the push button on this product at the time of startup. The behavior of MODE_1 and MODE_2 is configurable.

Operation Mode	Description
MODE_1	The mode assumed to be used for normal operation.
MODE_2	The mode assumed to be used for changing settings.
MODE_3 (Recovery Mode)	All configurations are deleted and restored with "Firmware Default Setting".

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

By the following procedure, user can set this product into each mode.

Please manipulate this product according to the following instructions.

Operating Instructions	Slide Switch	Push Button	LED
Turn on this product with a slide switch while not pushing a button.	OFF	OFF	lighting-off
	ON		blinking (1 second)
			lighting-off

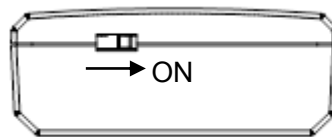


Figure 7-1: Mode 1

7-1-1-1. Behavior of Mode 1

LED blinks during 1 second, after the beacon unit is turned on.

Advertising (Transmitting Beacon) starts depending on configurations.

The followings are default configuration.

- During 15 seconds from powered on: Remote Controllable Peripheral Mode (Connectable)
- After 15 seconds from powered on: Broadcast Mode (Non-Connectable, 1 second interval)

Note: A push button can be used not just for switching each operation mode but for using the additional functions described below. WRITE_BTN_CONFIG_NV command can be used to set each function.

Note: Operation parameters are configurable.

WRITE_AB_NV Command

WRITE_REMOTE_CMD_ENABLE_NV Command

Note: Refer to the document of "Bluetooth Smart Beacon (FDC Beacon) Functional, Firmware Specification".

7-1-2. Mode 2 (Remote Controllable Mode)

Operating Instructions	Slide Switch	Push Button	LED
Turn on this product with a slide switch while pushing a button. Then LED will light up in 1 second.	OFF	ON	lighting-off
	ON		lighting-off (1 second)
Stop pushing a button within 5 seconds, after LED lights up.			lighting-up
			lighting-up (within 5 seconds)
		OFF	lighting-off

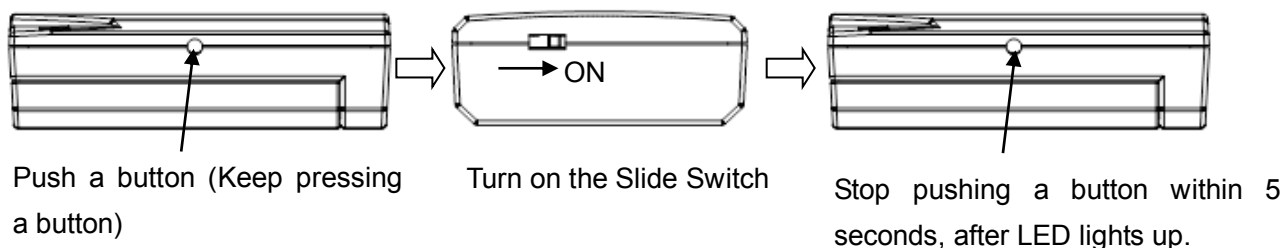


Figure 7-2: Mode 2

7-1-2-1. Behavior of Mode 2

Remote Controllable mode is prepared to re-configure this product by connecting from central device.

Note: On the default configuration, also during 15 seconds after powered on, the beacon unit is in this mode. On actual operation, non-connectable might be desirable for normal use.

Note: Refer to the document of “*Bluetooth* Smart Beacon (FDC Beacon) Functional, Firmware Specification”.

7-1-2-2. How to change advertising data

On the default configuration, user can change advertising data by using following command.

Example) `write_adv_data_nv_140946434c20576972656c657373204d6f64756c65`

0x14	Length of this Data
0x09	AD type = Complete local name
0x46	'F'
0x43	'C'
0x4c	'L'
0x20	' '
0x57	'W'
0x69	'i'
0x72	'r'
0x65	'e'
0x6c	'l'
0x65	'e'
0x73	's'
0x73	's'
0x20	' '
0x4d	'M'
0x6f	'o'
0x64	'd'
0x75	'u'
0x6c	'l'
0x65	'e'

This is the setting that advertise "FCL Wireless Module" as device name.

Note: Our central module can be used for changing these setting.

WRITE_AB_NV command can be used for changing the parameter of advertising.

Note: Refer to the document of "Bluetooth Smart Beacon (FDC Beacon) Functional, Firmware Specification".

7-1-3. Mode 3 (Method of Starting on Recovery Mode)

Operating Instructions	Slide Switch	Push Button	LED
Turn on this product with a slide switch while pushing a button. Then LED will light up in 1 second.	OFF	ON	lighting-off
	ON		lighting-off (1 second)
Continues to push a button more than 15 seconds. Stop pushing a button within 5 seconds, after LED starts blinking. Then all configuration will be initialized and automatically re-boots.	ON	ON	lighting-up
			lighting-up (15 seconds)
		blinking (within 5seconds)	
		OFF	-

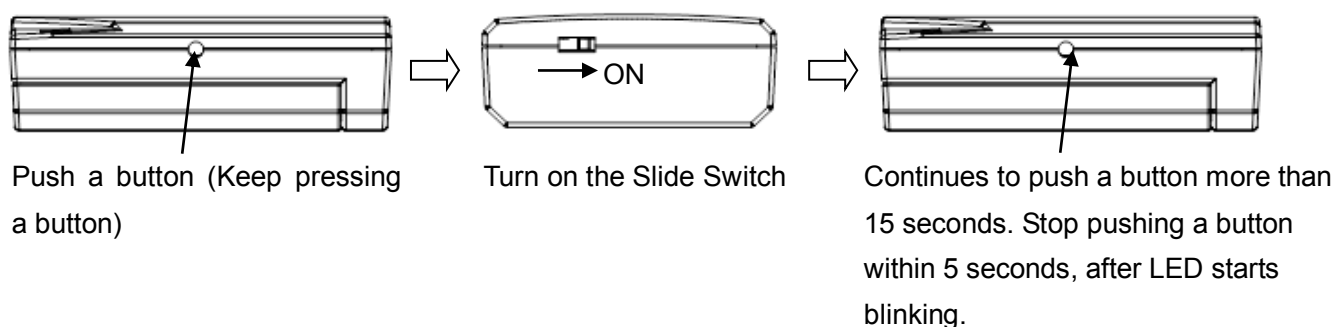


Figure 7-3: Mode 3

7-1-3-1. Behavior of Mode 3

Recovery mode is the function that intend to forcibly recover this product to the default configuration if this product has been uncontrollable by incorrect setting.

Note: All data including advertising data are initialized. Please use this function carefully.

Please refer to section 8.

7-1-3-2. Changeover function of Advertising data

WRITE_BTN_CONFIG_NV command and WRITE_ADV_DATA_EX_NV command can be used for changing the Advertising data.

Cumulative number of pushing a button	Condition	INDEX No.	Status
			Advertising data
0	The setting value of WRITE_BTN_CONFIG_NV Command is [2]	1	Advertising data 1
1		2	Advertising data 2
2		3	Advertising data 3
3		1	Advertising data 1
...	

The following is the setting that advertise “FCL Wireless Module” as device name in INDEX No.

Example) write_adv_data_nv_1_140946434c20576972656c657373204d6f64756c65

Note: LED is blinking that the number of selected INDEX No.

Note: Refer to the document of “*Bluetooth* Smart Beacon (FDC Beacon) Functional, Firmware Specification”.

8. Firmware initial setting

* These settings differ from the“Factory Default Setting” to be written on mass-production in advance.

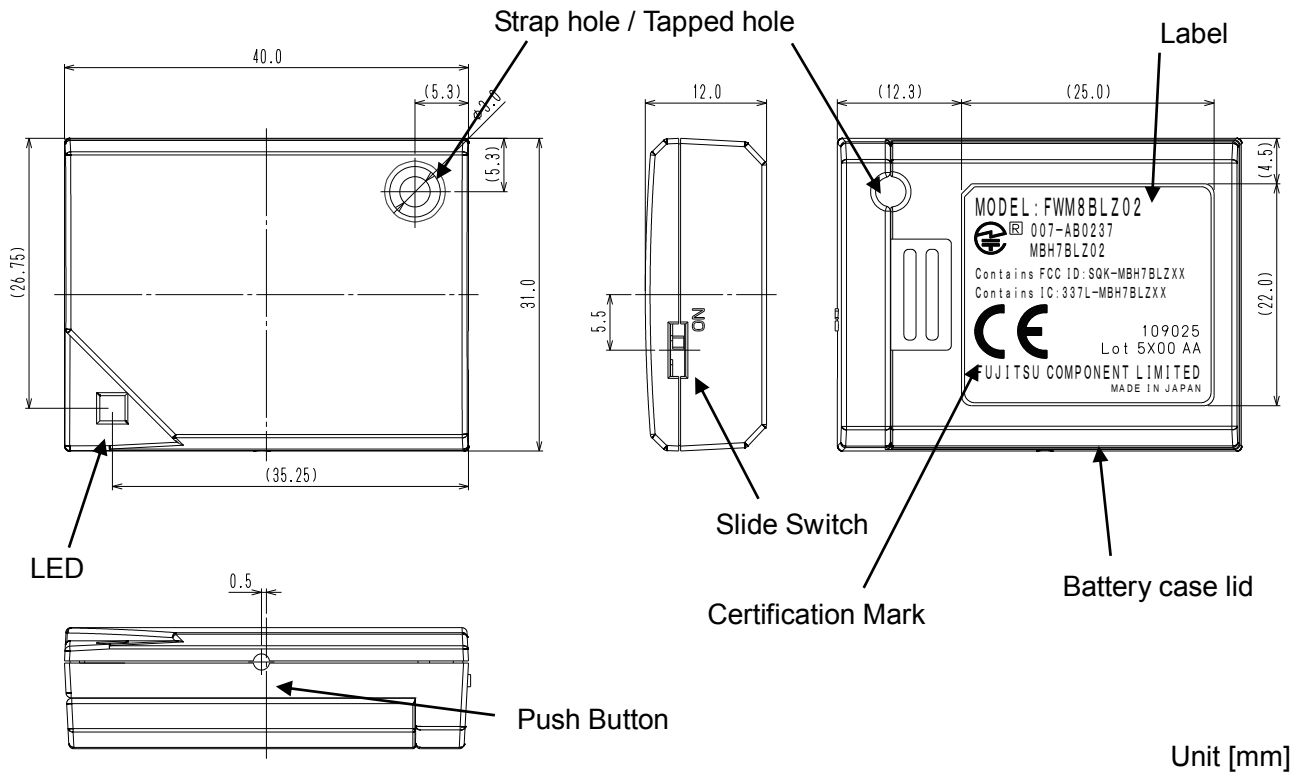
* In case of Mode 3 (Section 7-1-3), all data is initialized as below.

Command Name	Parameter Name	Value	Explanatory Remarks
WRITE_AS_NV	AS_MODE_1	0 (Disable)	
	AS_MODE_2	2 (Enable)	Used the setting by WRITE_AS_PARAM2_NV command.
WRITE_AS_PARAM1_NV	MODE (1st)	General	*Unused
	INTERVAL (1st)	0x0320	
	TIMEOUT (1st)	15	
	MODE (2nd)	General	
	INTERVAL (2nd)	0x0640	
	TIMEOUT (2nd)	60	
	MODE (3rd)	General	
	INTERVAL (3rd)	0x0c80	
WRITE_AS_PARAM2_NV	MODE (1st)	General	
	INTERVAL (1st)	0x0140	200 milliseconds
	TIMEOUT (1st)	15	15 seconds
	MODE (2nd)	General	
	INTERVAL (2nd)	0x0640	1 second
	TIMEOUT (2nd)	0	
	MODE (3rd)	General	*Unused
	INTERVAL (3rd)	0x0c80	*Unused
WRITE_AB_NV	AUTO_BROADCAST	2	Enabled(Extended Mode)
	ADV_DATA	1	Used the user defined advertising data. Scan response data is not used.
	INTERVAL	0x0640	1 second
	TIMEOUT	0	
WRITE_ADV_DATA_NV	ADV_DATA	0c0946434c20 426561636f6e 31	Complete local name 「FCL Beacon1」
WRITE_ADV_DATA_EX_NV (1)	ADV_INDEX	1	The same setting as that by WRITE_ADV_DATA_NV command.
	ADV_DATA	-	
WRITE_ADV_DATA_EX_NV (2)	ADV_INDEX	2	Complete local name 「FCL Beacon2」
	ADV_DATA	0c0946434c20 426561636f6e 32	
WRITE_ADV_DATA_EX_NV (3)	ADV_INDEX	3	Complete local name 「FCL Beacon3」
	ADV_DATA	0c0946434c20 426561636f6e 33	
WRITE_SR_DATA_NV	SR_DATA	None	

Command Name	Parameter Name	Value	Explanatory Remarks
WRITE_SR_DATA_EX_NV (1)	SR_INDEX	1	The same setting as that by WRITE_SR_DATA_NV command.
	SR_DATA	-	
WRITE_SR_DATA_EX_NV (2)	SR_INDEX	2	
	SR_DATA	None	
WRITE_SR_DATA_EX_NV (3)	SR_INDEX	3	
	SR_DATA	None	
WRITE_SEC_PARAM_NV	IO_CAPABILITY	3	No input No output
	MITM_PROTECTION	0	
	BOND	1	
	OOB	0	
	TIMEOUT	30	
WRITE_TX_POWER_NV	TX_POWER	0	
	OFFSET_FOR_ADV	0	
WRITE_NAME_NV	NAME	FWM8BLZ02	
WRITE_APPEARANCE_NV	APPEARANCE	0x0000	
WRITE_PPCP_NV	MIN_INTERVAL	0x0006	7.5 milliseconds
	MAX_INTERVAL	0x0027	48.75 milliseconds
	SLAVE_LATENCY	0x0000	
	SVTO	0x0190	
WRITE_BOOT_MODE_NV	MODE	0	Reserved parameter
	SKIP_CRC_CHECK	0	Reserved parameter
	CLK_CONFIG	3	
WRITE_REMOTE_CMD_ENABLE_NV	ENABLE_REMOTE_CMD	1 (Enable)	
WRITE_PW_NV	PASSWORD	None	None
	ENABLE_PROTECT	0	
	ENABLE_FAIL_COUNT	0	
	ENABLE_RESET	0	
WRITE_ADDR_NV	OVERWRITE_ADDR	0	Not overwrite
	BD_ADDR	000000000000	*Unused
	ADDR_TYPE	0	*Unused
	CYCLE_INTERVAL	0x0384	*Unused
	OVERWRITE_IRK	0	*Unused
	IRK	0x0000000000 000000000000 000000000000 000000000000 000000000000 000000	*Unused
WRITE_SEC_LEVEL_NV	SEC_LEVEL	2	
WRITE_PASSKEY_NV	ENABLE_STATIC_PASSKEY	0 (Disable)	
	STATIC_PASSKEY	000000	*Unused
WRITE_WL_NV	FILTER_POLICY	0	
WRITE_BTN_CONFIG_NV	BTN_CONFIG	1	LED blinking

9. Mechanical Characteristics

9-1. Appearance and Dimensions



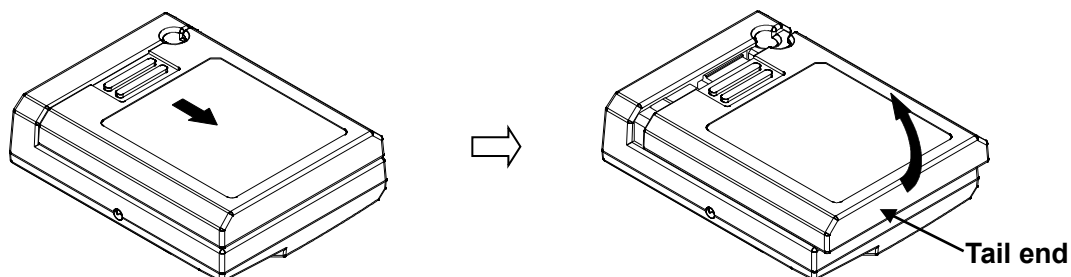
10. Storage Conditions

- Do not store this Beacon Unit 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 the Beacon Unit during transportation. It may result in damage, malfunction, or deterioration of quality.

11. Mounting / Replacement method of battery

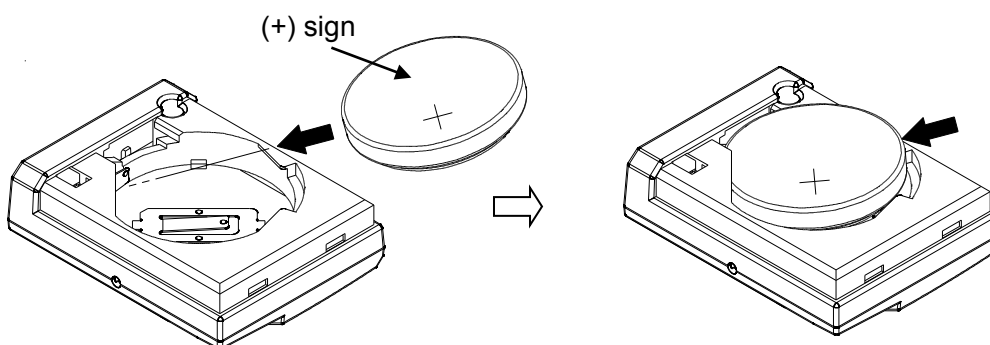
11-1. Removal of a battery case lid

Slide a battery case lid in the direction of an arrowed line, and click is unlocked.
Lift a tail end of a battery case lid slantingly and remove it.

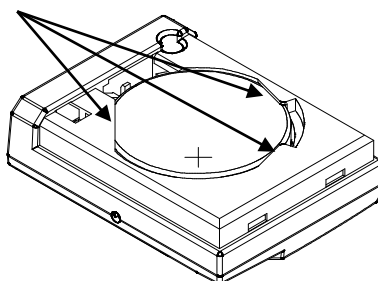


11-2. Mounting of a battery

Insert in a store part of a battery slantingly with the (+) sign facing up.
When insert a battery, push it gently.



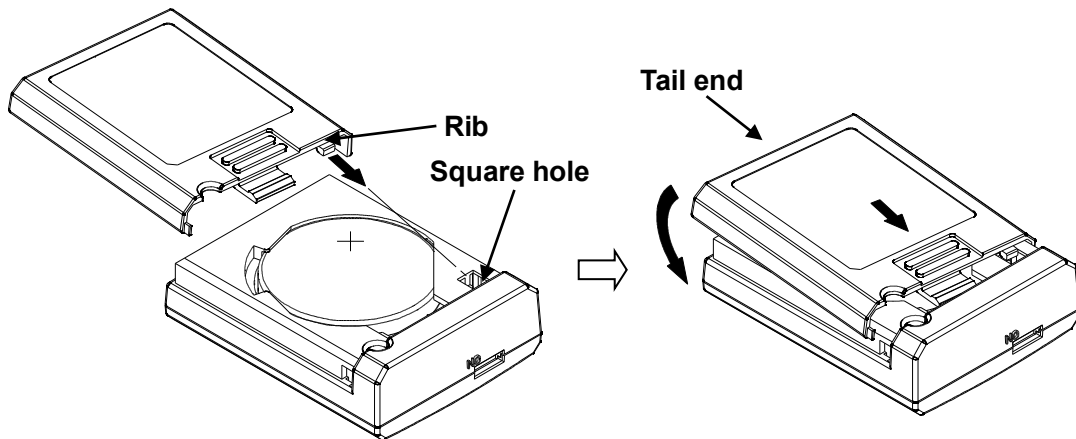
Battery is held by a rib of a store part of a battery



The state that a battery was mounted

11-3. Installation of a battery cover lid

Insert a rib of a battery case lid in square hole of a store part of a battery slantingly.
Parallel the tail end to a store part of a battery and insert a battery case lid.



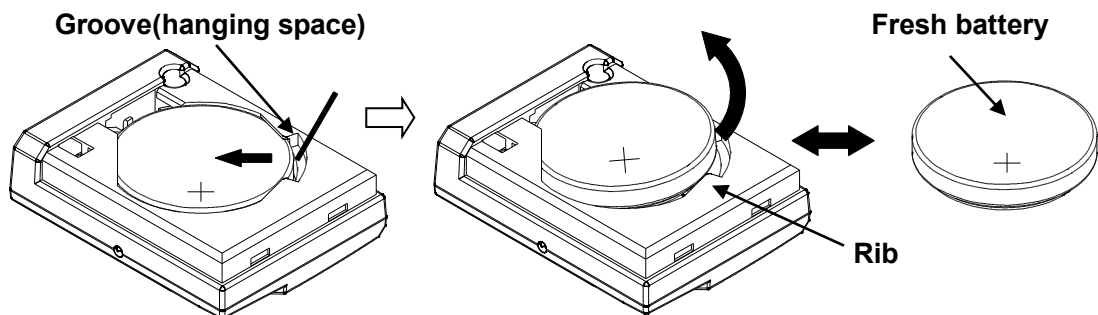
11-4. Replace battery

Remove a battery case lid. (Refer to a procedure of 11-1)

Hang a nail (or toothpick and so on) on a groove (hanging space) of a store part of a battery and push a battery gently in the direction of an arrowed line.

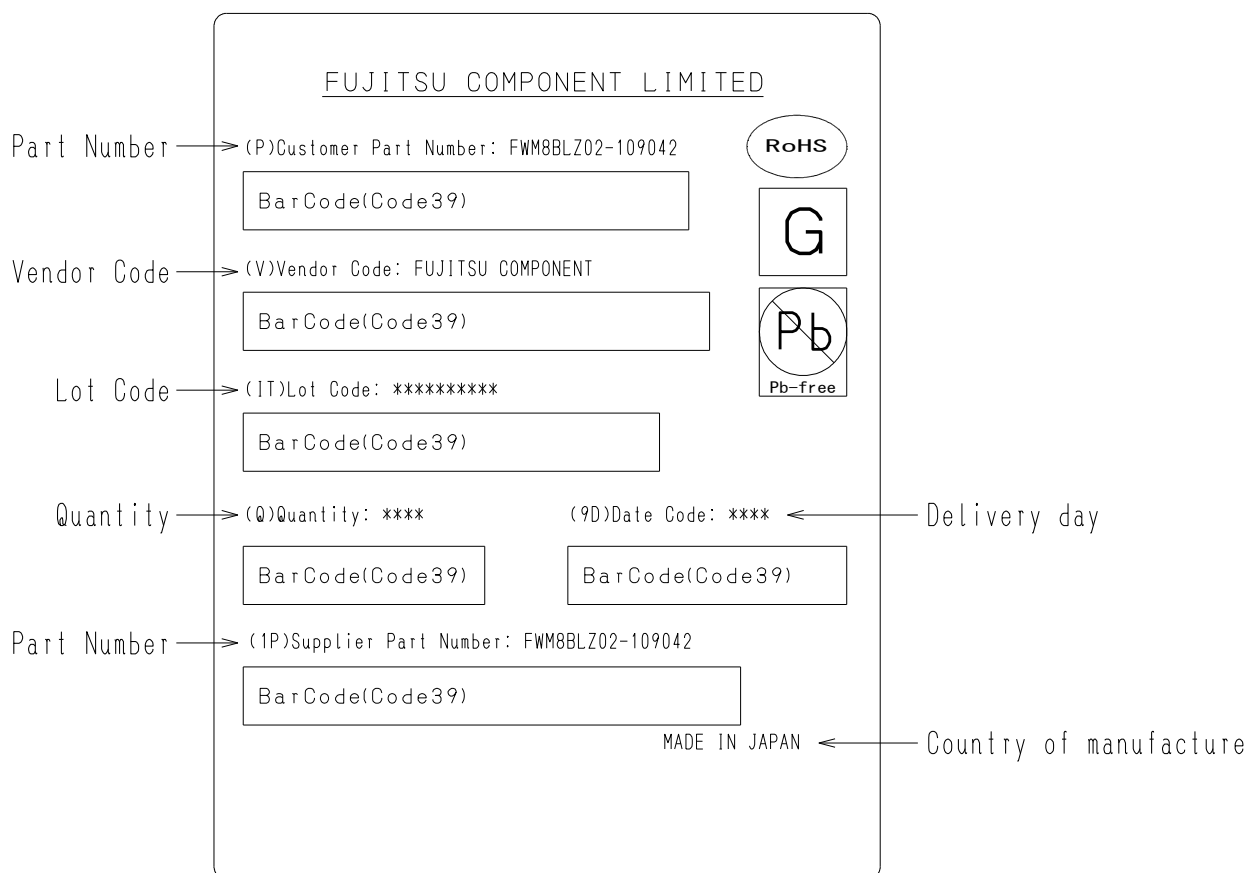
Lift a battery up in the direction of an arrowed line, and remove it from a rib.

Replace a fresh battery.

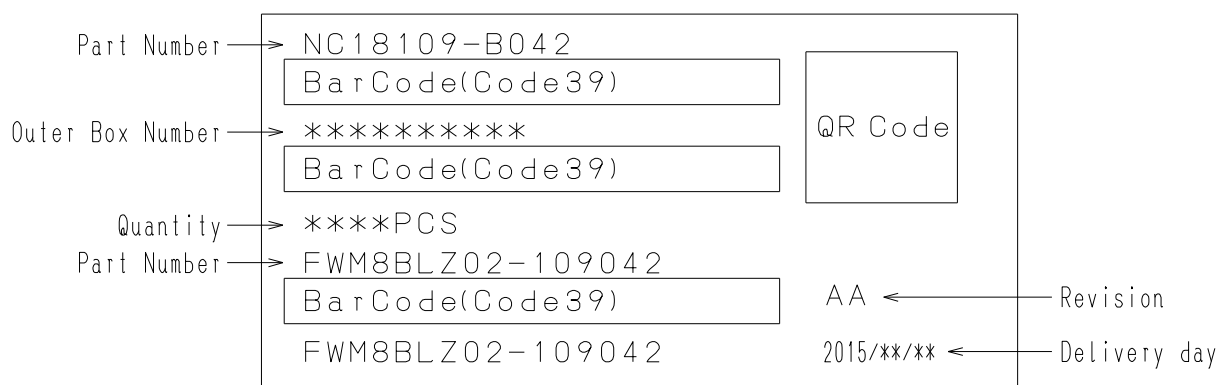


12. Packing Specification in shipment

12-1. Reel label

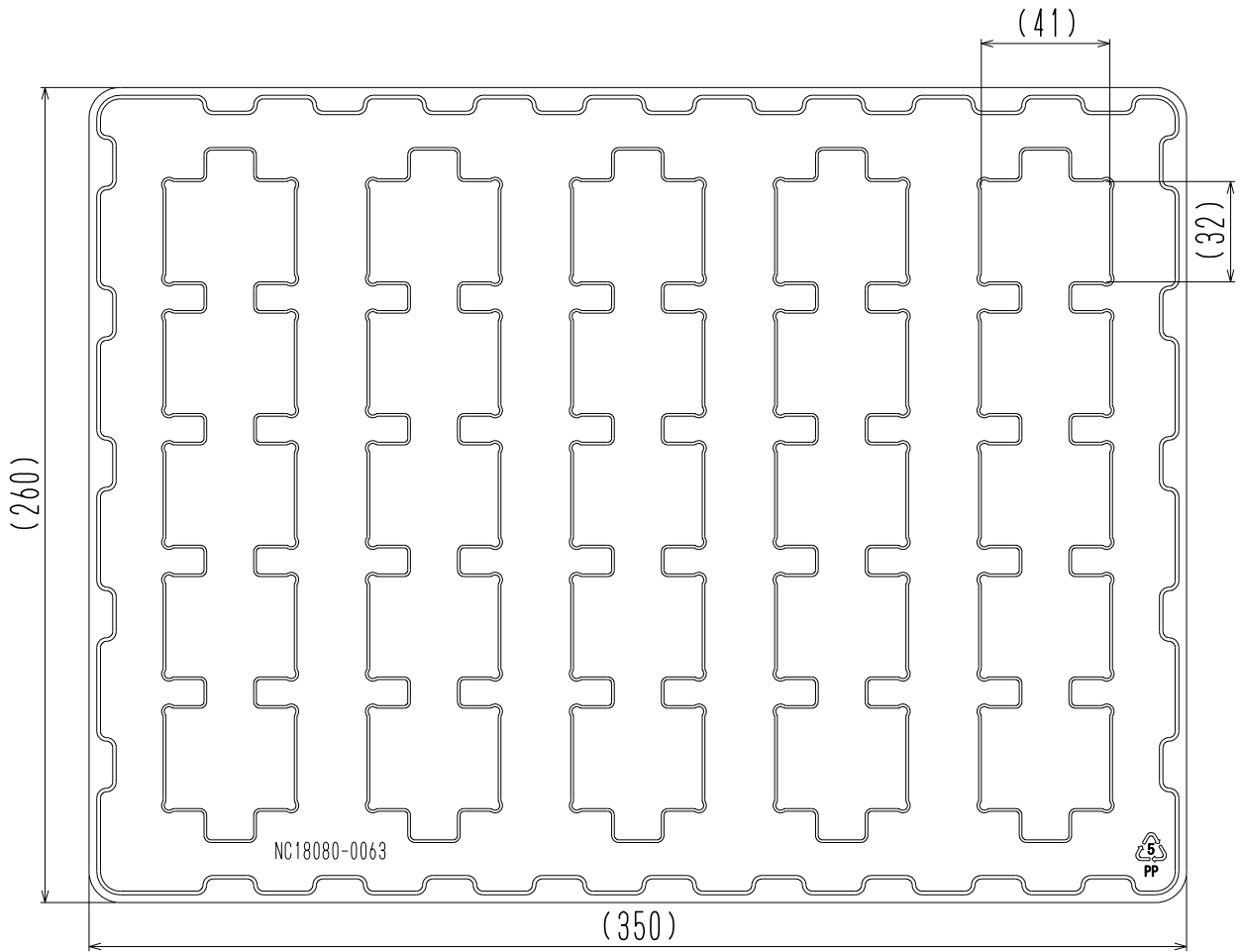


12-2. Outer Packaging Label

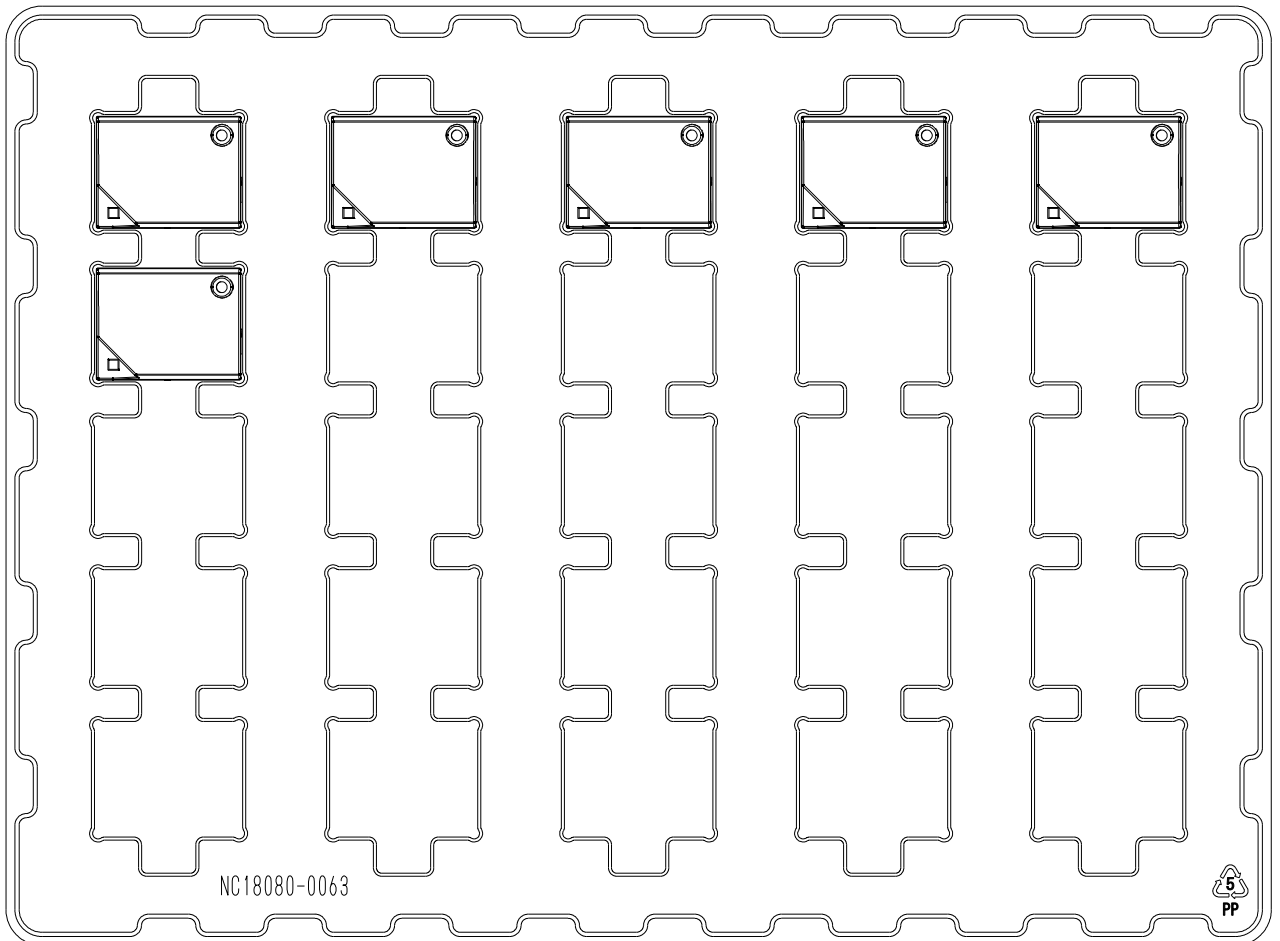


12-3. Shipment Packing

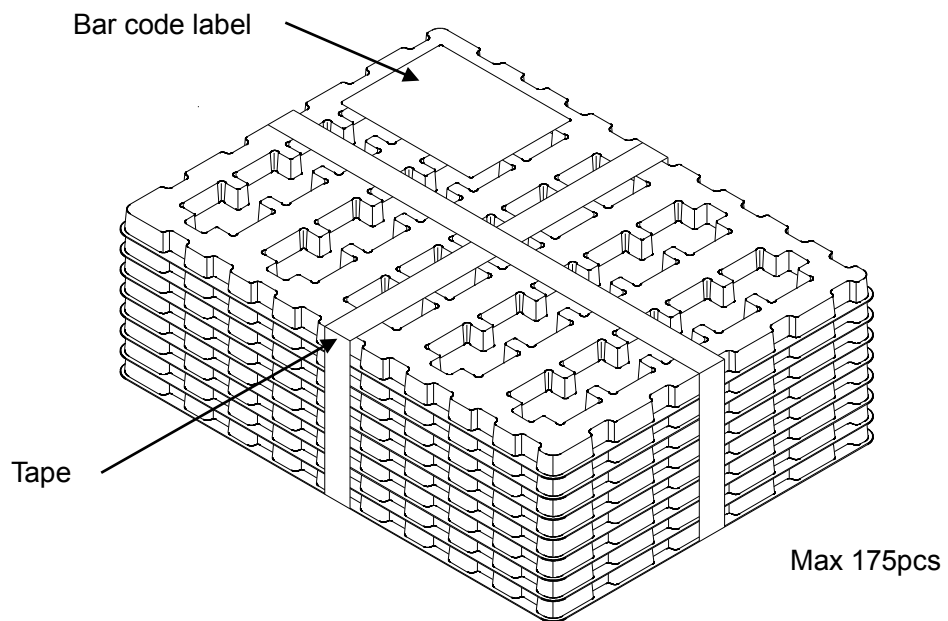
12-3-1. Tray packing



Tray dimensions

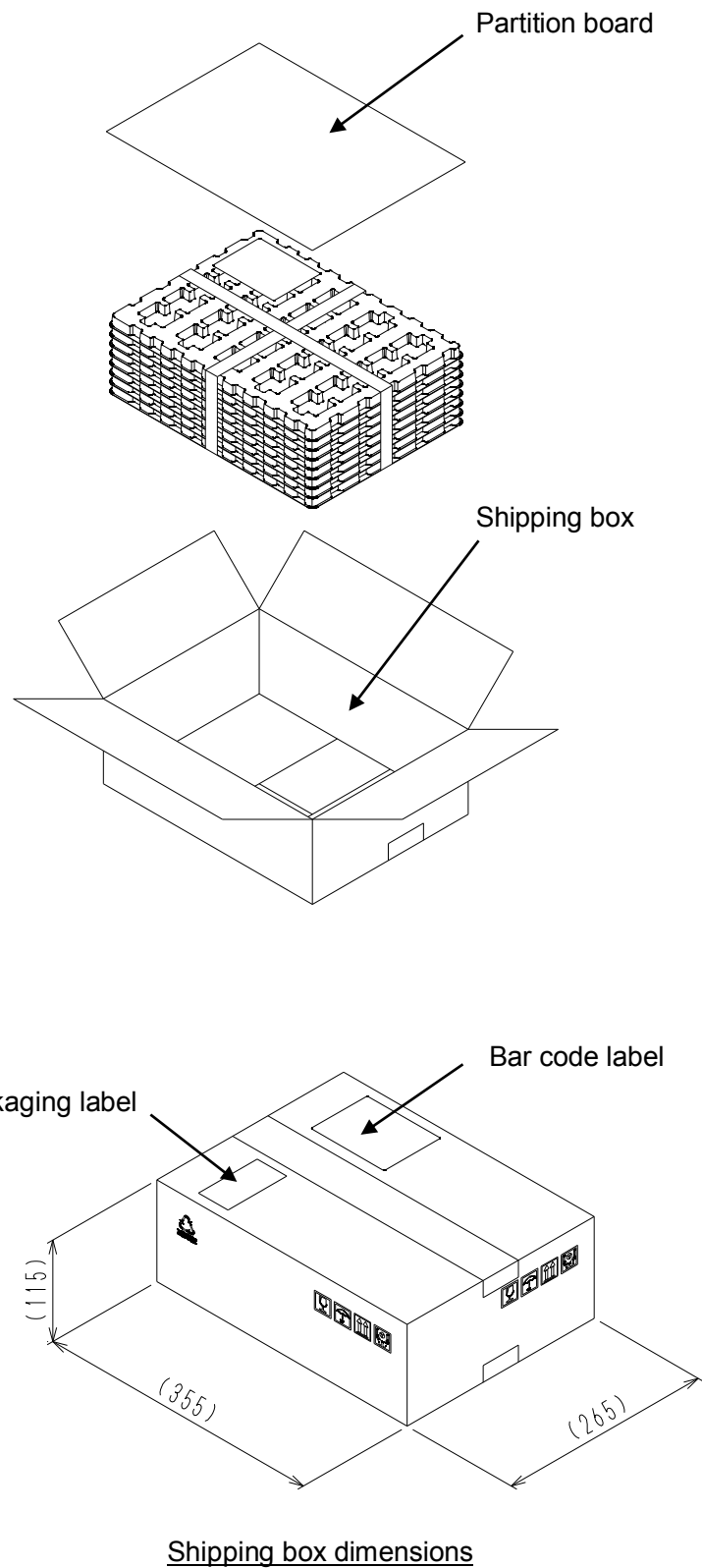


Tray packing



Tray convergence

12-3-2. Shipping package



13. Revision History

Revision	Contents change	Date
Rev. 0.01	Created first edition.	MAR 30, 2015
Rev. 0.02	Section 6-1 and 6-2 was revised. Section 6-3: Added.	APR 07, 2015
Rev. 0.03	Section 2 was revised. Section 6-1 and 6-2 were revised. Section 8 was revised. Section 10-1: Added description about Bar code label	JUN 03, 2015
Rev. 0.04	Full-fledged revision for official release	SEP 30, 2015
Rev. 0.05	Section 11-1 was revised.	OCT 5, 2015