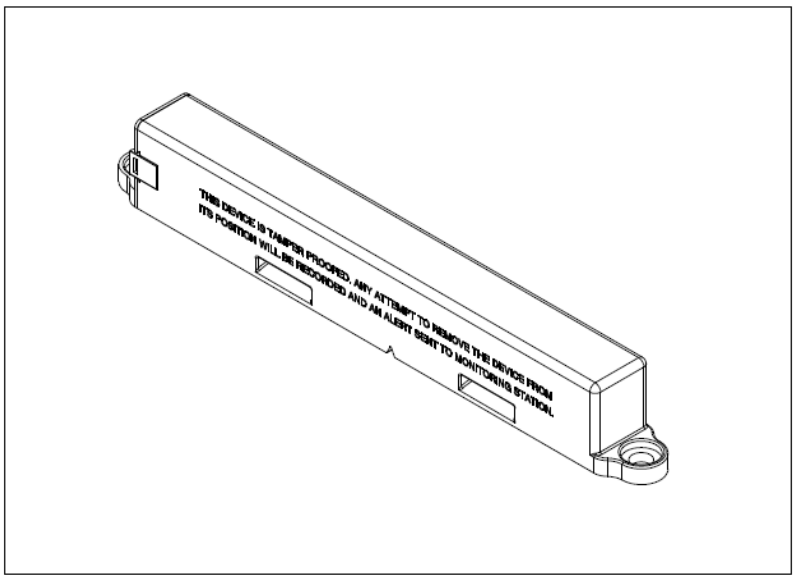
IET10MO User Manual

Version 1.7



2023-01-09

Connecting Tomorrow

Contents

1. Revision History

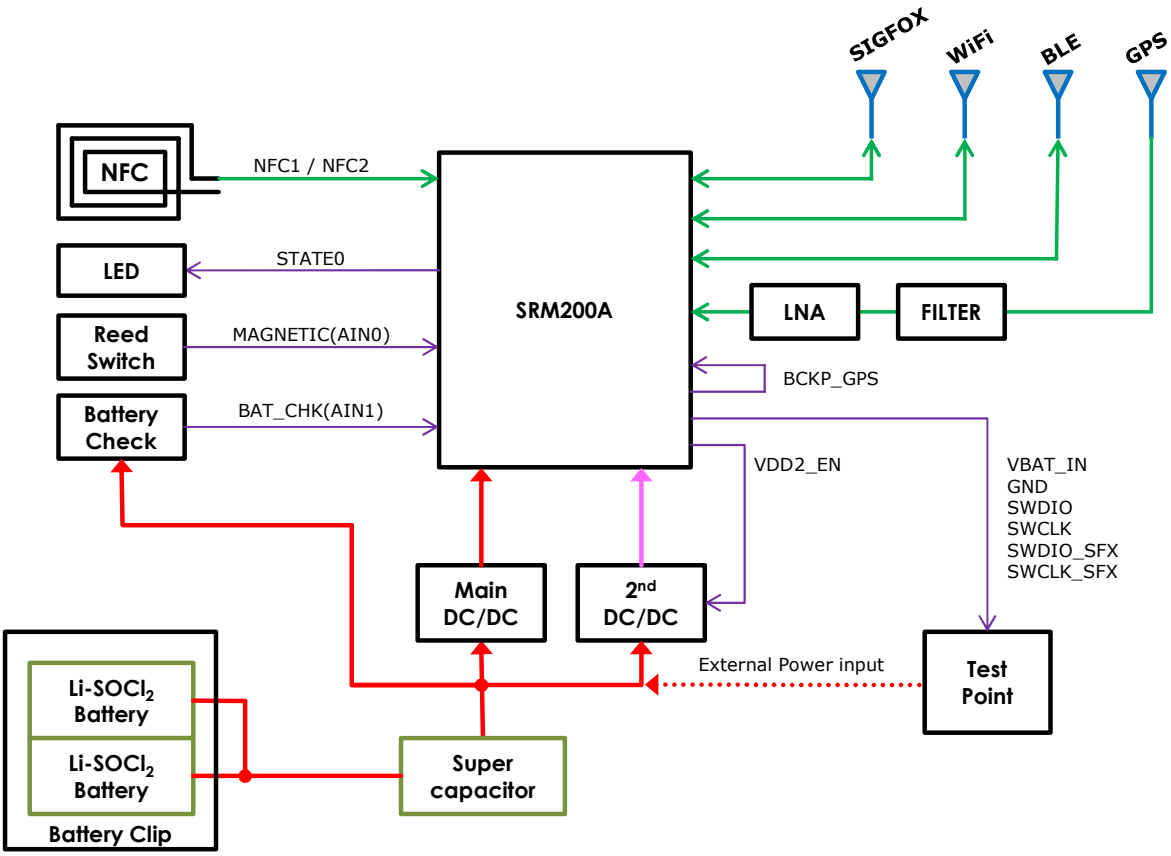
Date	Rev.	Editor	Description
Apr. 06, 2020	1.0	KD Kim	First release
May. 25, 2020	1.1	KH Kim	Antenna gain, RF power consumption update
Apr. 12, 2021	1.2	KD Kim	Installation guide revision and supplementation
Oct. 21, 2021	1.3	KD Kim	Battery information update
Jan. 06, 2022	1.4	KD Kim	Feature content update.
Apr. 14, 2022	1.5	KD Kim	Feature content & Precautions update.
Jul. 6 2022	1.6	KD Kim	Change the company name and apply the designated font
Jan. 9 2023	1.7	YJ Oh	Installation direction update.

2. Features

Items	Description
Dimensions	197mm X 20mm X 27mm
Enclosure Material	Polycarbonate
Battery Spec.	Primary, Li-$SOCl_2$ 2packs, 4800mAh, 3.6V Battery replaceable
Operating Temperature	-30 ~ +60℃
Ingress Protection code	IP68
Wireless communication	GPS, WIFI, Bluetooth, Sigfox
Device management	Bluetooth 4.2 support BLE FOTA
Host CPU Spec.	Cortex M4F, 512kB Flash / 64kB RAM
NFC	Tag-A support, Easy Bluetooth pairing with NFC tagging
Built-in sensor	3-axes accelerometer, Magnet reed switch
Current consumption	Standby current 28uA (*Different for each operation scenario.)
Life time	If you send 2 messages per day in RC1 at 20 degrees, it can be used for about 6 years. Actual usage time may vary depending on battery conditions and operating scenarios.

3. Block-Diagram

IET10MO Block Diagram



4. Electrical Characteristic

4.1. Temperature Characteristic

Symbol	Parameter	Rating	Unit
OT	Operating Temperature	-30 to +60	℃
ST	Storage Temperature(*)	30 max	℃

*The self-discharge rate of a battery increases as the ambient temperature rises.

4.2. DC Characteristic

Symbol	Parameter	Min.	Typ.	Max.	Unit
VBAT	Battery pack voltage		3.6		V
CBAT	Battery capacity per 1pack		2700		mAh
Current	Deep sleep current		4		uA
	Standby		28		uA
	WIFI scan mode		51	80	mA
	GPS scan mode		23	28	mA
	Sigfox RC Scan		21	22	mA
	Tx Current mode1 (RC1/3/5) (RF Power Level = 14dBm)	-	34	39	mA
	Tx Current mode2 (RC2/4) (RF Power Level = 24dBm)		230	250	mA
	Rx Current	-	12.22	22	mA

5. RF Specifications

5.1 Sigfox

Conditions: VCC=3.3V, Temp=25℃

Parameter			Min.	Typ.	Max.	Unit
Frequency Range	RC1	Tx	868.034	868.130	868.226	MHz
		Rx	869.429	869.525	869.621	MHz
	RC2	Tx	902.104	902.200	902.296	MHz
		Rx	905.104	905.200	905.296	MHz
	RC3	Tx	923.104	923.200	923.296	MHz
		Rx	922.104	922.200	922.296	MHz
	RC4	Tx	920.704	920.800	920.896	MHz
		Rx	922.204	922.300	922.396	MHz
	RC5	Tx	923.004	923.100	923.196	MHz
		Rx	922.004	922.100	922.196	MHz
	RC6	Tx	865.104	865.200	865.296	MHz
		Rx	866.204	866.300	866.396	MHz
Tx output power	RC1, RC6		+12.5	+14.5	-	dBm
	RC2, RC4		+21.5	+23.5	-	dBm
	RC3, RC5		+11.0	+13.0	-	dBm
Frequency Error Tolerance(+25℃)			-3.0	-	+3.0	ppm
2nd Harmonics(conducted)			-	-45	-35	dBm
3nd Harmonics(conducted)			-	-53	-35	dBm
Rx Sensitivity(@600bps, GFSK)			-	-	-123	dBm
Rx Spurious Emission(30MHz~12.75GHz)			-	-	-54	dBm

5.2 BLE (Bluetooth Low Energy)

Conditions: VCC=3.3V, Temp=25℃

Parameter		Min.	Typ.	Max.	Unit
RF Characteristics					
RF Frequency Range		2.402	-	2.480	GHz
Output Power [TRM-LE/CA/01/C]		-1.0	3.0	7	dBm
In Band Emission[TRM-LE/CA/03/C] ±2MHz offset ±3MHz offset				 -20 -30	dBm
Modulation Characteristics [TRM-LE/CA/05/C]	Delta F1 Avg.	225	-	275	KHz
	Delta F2 Max.	185	-	-	KHz
	Delta F2 Avg/F1 Avg	0.8	-	-	-
Carrier Frequency Offset and Drift [TRM-LE/CA/06/C]	Initial Center Frequency Tolerance	-50	-	50	KHz
	|Fn| Max.	-150	-	150	KHz
	|F0 -Fn| Max.	-	-	50	KHz
	|F1 – F0|	-	-	20	KHz
	|Fn = Fn-5| max.	-	-	20	KHz
Receiver Sensitivity [PER<30.8%, 1500packets]		-	-93.5	-70	dBm
Maximum input lever [PER<30.8%, 1500packets]		-10	0		dBm

5.3 WIFI

Conditions: VCC=3.3V, Temp=25℃

Parameter		Min.	Typ.	Max.	Unit
Target Power for TX					
2.4GHz	Tx mode, Cont.Tx@11M		215		mA
	Tx mode, Cont.Tx@54M		155		mA
	Tx mode, Cont.Tx@HT20 MCS7		156		mA
	Rx mode, Cont. Rx@11M		77		mA
	Rx mode, Cont. Rx@54M		77		mA
	Rx mode, Cont. Rx@HT20 MCS7		77		mA

Parameter	Conditions	Min.	Typ.	Max.	Unit
Minimum Receiver Sensitivity in 802.11b mode					
1Mbps	PER<8%, Packet size = 1024bytes	-	-95	-80	dBm
2Mbps		-	-91	-80	dBm
5.5Mbps		-	-84	-76	dBm
11Mbps		-	-84	-76	dBm
Minimum Receiver Sensitivity in 802.11g mode					
6Mbps	PER<10%, Packet size = 1024bytes	-	-89	-82	dBm
9Mbps		-	-88	-81	dBm
12Mbps		-	-87	-79	dBm
18Mbps		-	-85	-77	dBm
24Mbps		-	-82	-74	dBm
36Mbps		-	-79	-70	dBm
48Mbps		-	-74	-66	dBm
54Mbps		-	-72	-65	dBm
Minimum Receiver Sensitivity in 802.11n mode					
HT20, MCS7	PER<10%	-	-70	-64	dBm
Maximum Input Signal Level					
802.11b mode	PER<8%	-10	-	-	dBm
802.11g mode	PER<10%	-20	-	-	dBm
802.11n mode	PER<10%	-20	-	-	dBm
Adjacent channel rejection (ACR) in 802.11b mode					
1Mbps	PER<8%, Packet size = 1024bytes	35	-	-	dB
2Mbps		35	-	-	dB
5.5Mbps		35	-	-	dB
11Mbps		35	-	-	dB

Adjacent channel rejection (ACR) in 802.11g mode					
6Mbps	PER<10%, Packet size = 1024bytes	16	-	-	dB
9Mbps		15	-	-	dB
12Mbps		13	-	-	dB
18Mbps		11	-	-	dB
24Mbps		8	-	-	dB
36Mbps		4	-	-	dB
48Mbps		0	-	-	dB
54Mbps		-1	-	-	dB
Adjacent channel rejection (ACR) in 802.11n mode					
MCS0	PER<10%	16	-	-	dB
MCS7		-2	-	-	dB

Parameter	Conditions	Min.	Typ.	Max.	Unit
Output Power in 802.11b mode, CCK					
1~11Mbps	As specified in IEEE802.11	7.5	10	12.0	dBm
Output Power in 802.11g mode, OFDM					
6M~54Mbps	As specified in IEEE802.11	7.5	10	12.0	dBm
Output Power in 802.11n mode, HT20, OFDM					
MCS0~7	As specified in IEEE802.11	7.5	10	12.0	dBm
Spectrum mask					
Margin to 802.11b/g/n all mode	Maximum output power	0	-	-	dBm
Modulation Accuracy in 802.11b mode					
1Mbps	As specified in IEEE802.11	-	-	35	%
2Mbps		-	-	35	%
5.5Mbps		-	-	35	%
11Mbps		-	-	35	%
Modulation Accuracy in 802.11g mode					
6Mbps	As specified in IEEE802.11	-	-	-5	dB
9Mbps		-	-	-8	dB
12Mbps		-	-	-10	dB
18Mbps		-	-	-13	dB
24Mbps		-	-	-16	dB
36Mbps		-	-	-19	dB
48Mbps		-	-	-22	dB

54Mbps		-	-	-25	dB
Modulation Accuracy in 802.11n mode					
HT20, MCS7	Full packet	-	-	-27	dB
Frequency Tolerance					
802.11b/g/n	Operating Temp.	-25	0	25	ppm

5.4 GPS

Conditions: VCC=3.3V, Temp=25℃

Parameter	Min.	Typ.	Max.	Unit
Frequency		1575.42		MHz
GPS Sensitivity				
Tracking		-160		dBm
Navigation		-159		dBm
Acquisition (Cold start)		-145		dBm
Time To First Fix (All satellites at -130dBm)				
Cold start		30		sec
Hot start		2		sec

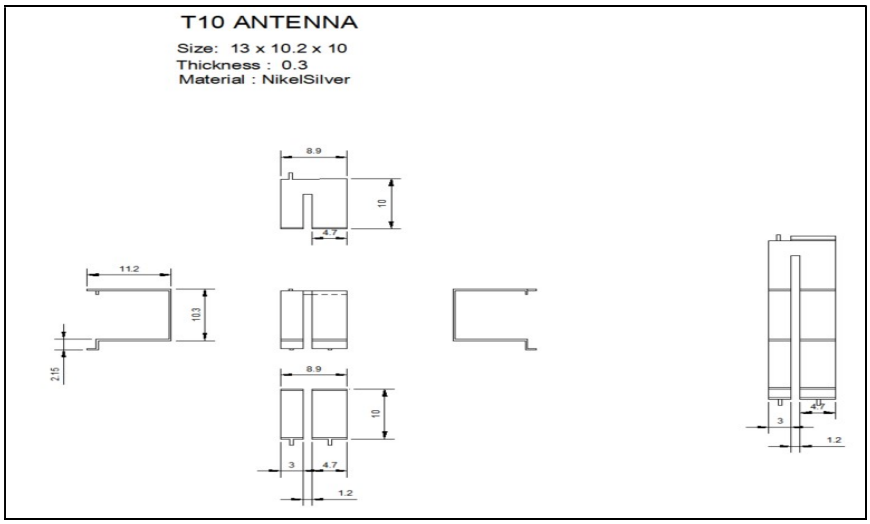
5.5 NFC

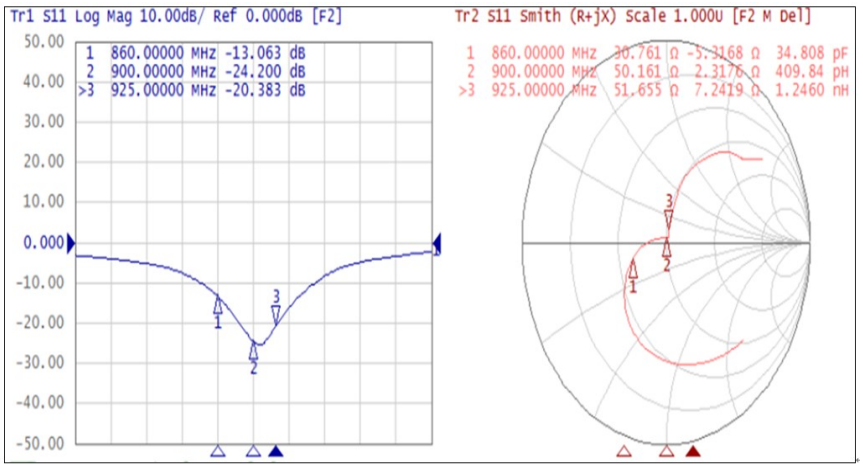
Parameter	Min.	Typ.	Max.	Unit
RF Input Frequency		13.56		MHz
ISO-14443A				
Carrier modulation index	95			%
Data Rate		106		Kbps
Modulation sub carrier frequency		13.56 /16		MHz

6. Antenna Specifications

6.1 Sigfox Antenna Specifications

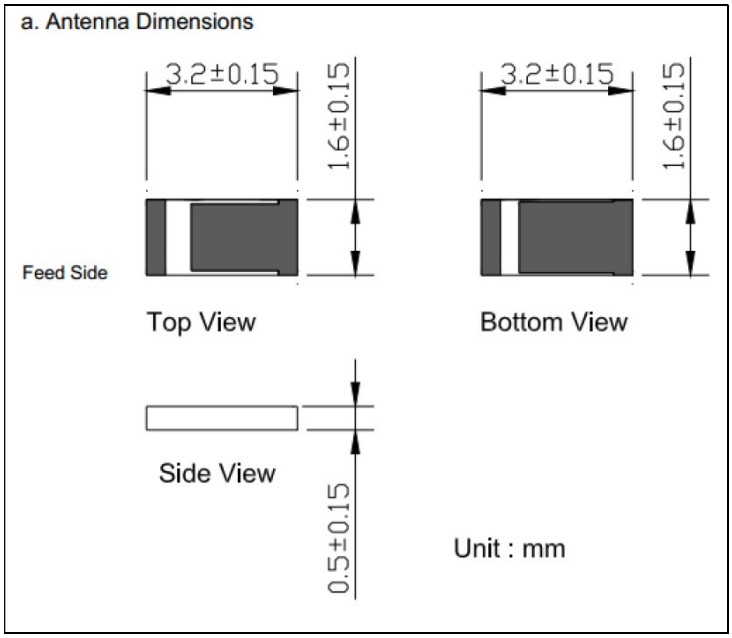
Parameter	Specifications	Unit
Antenna type	Metal Antenna(monopole)	-
Frequency range	860 ~ 930	MHz
VSWR	LESS THAN 2.0 : 1	-
Max. Gain	2.5	dBi
Average Gain	-1.5	dBi
Impedance	50	Ω
Polarization	Linear	-
Efficiency (Avg)	60	%
Size	13.0 x 10.2 x 10.0	mm



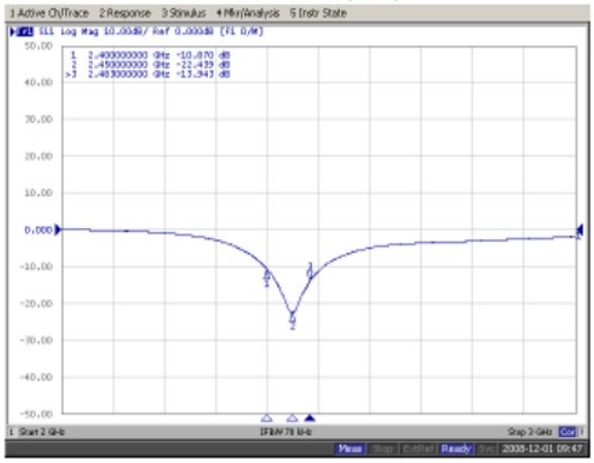


6.2 BLE and WIFI Antenna Specifications

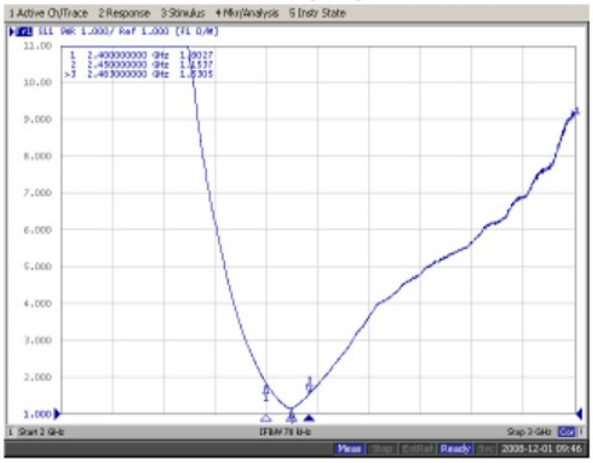
Parameter		Specifications	Unit
Outline Dimensions		3.2 x 1.6 x 0.5	mm
Frequency		2400~2500	MHz
Bandwidth		100	MHz
VSWR		2(typical)	-
Impedance		50	Ω
Gain	Peak	2.5(typical)	dBi
	Efficiency	84(typical)	%



Return Loss (S_{11})

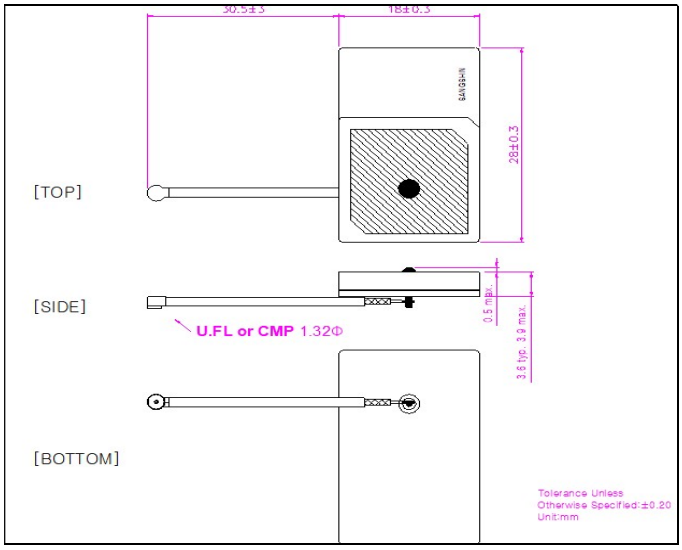


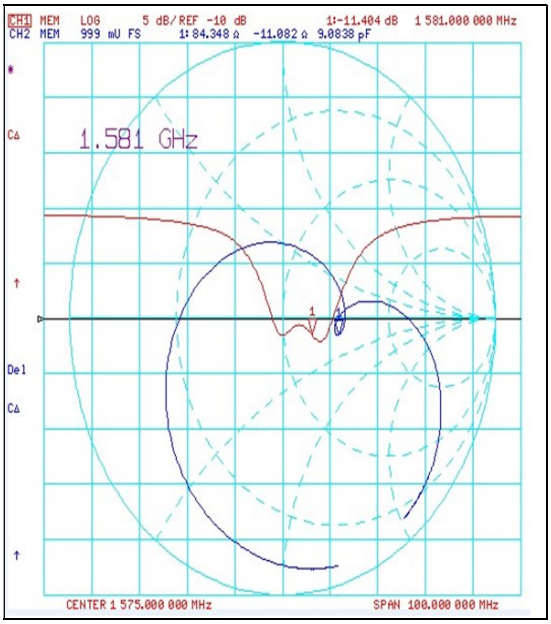
VSWR(S_{11})



6.3 GPS Antenna Specifications

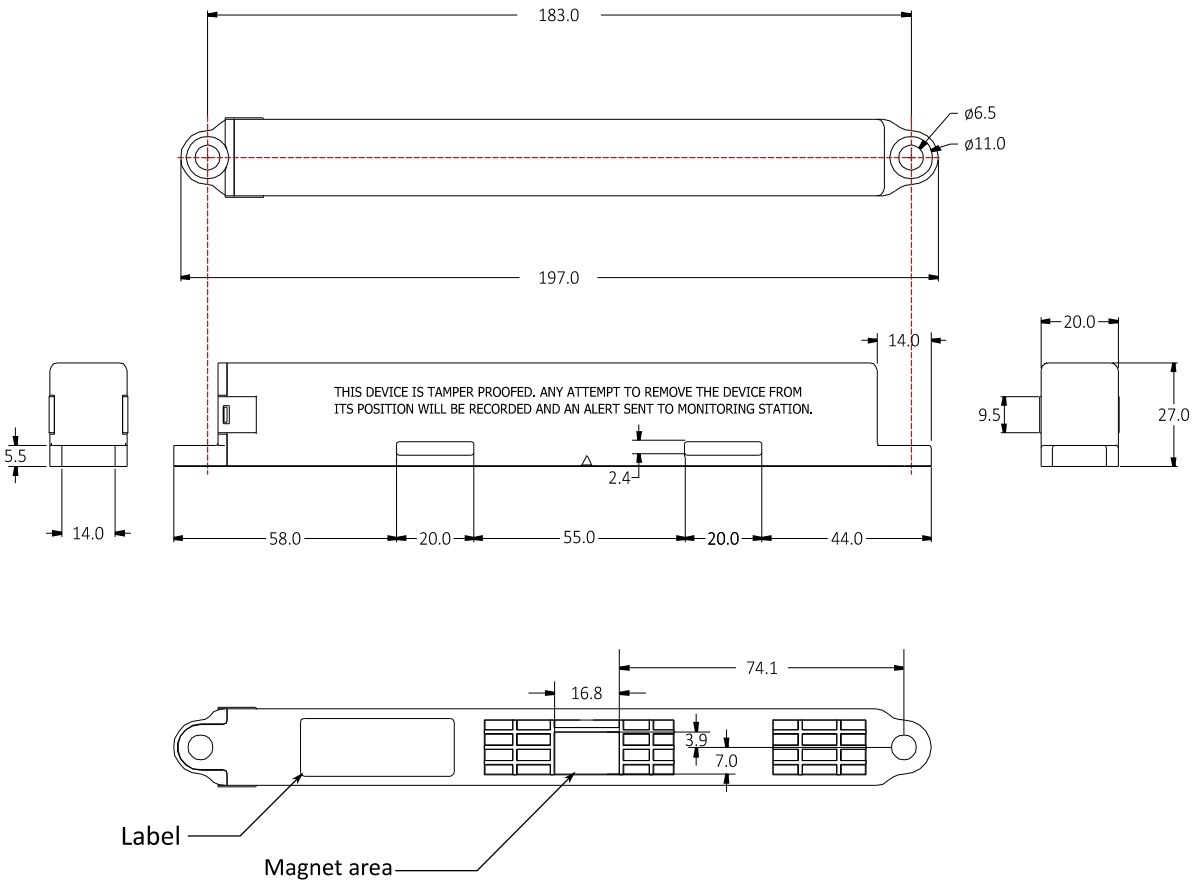
Parameter	Specifications	Unit
Antenna type	Ceramic Patch Antenna	-
Center Frequency(=Fc)	1575 ± 3	MHz
Return Loss @ Fc	Min. 5	dB
Average Gain	-1.8	dBi
Impedance	50	Ω
Polarization	R.H.C.P	-
Size	28.0 x 18.0 x 3.6	mm



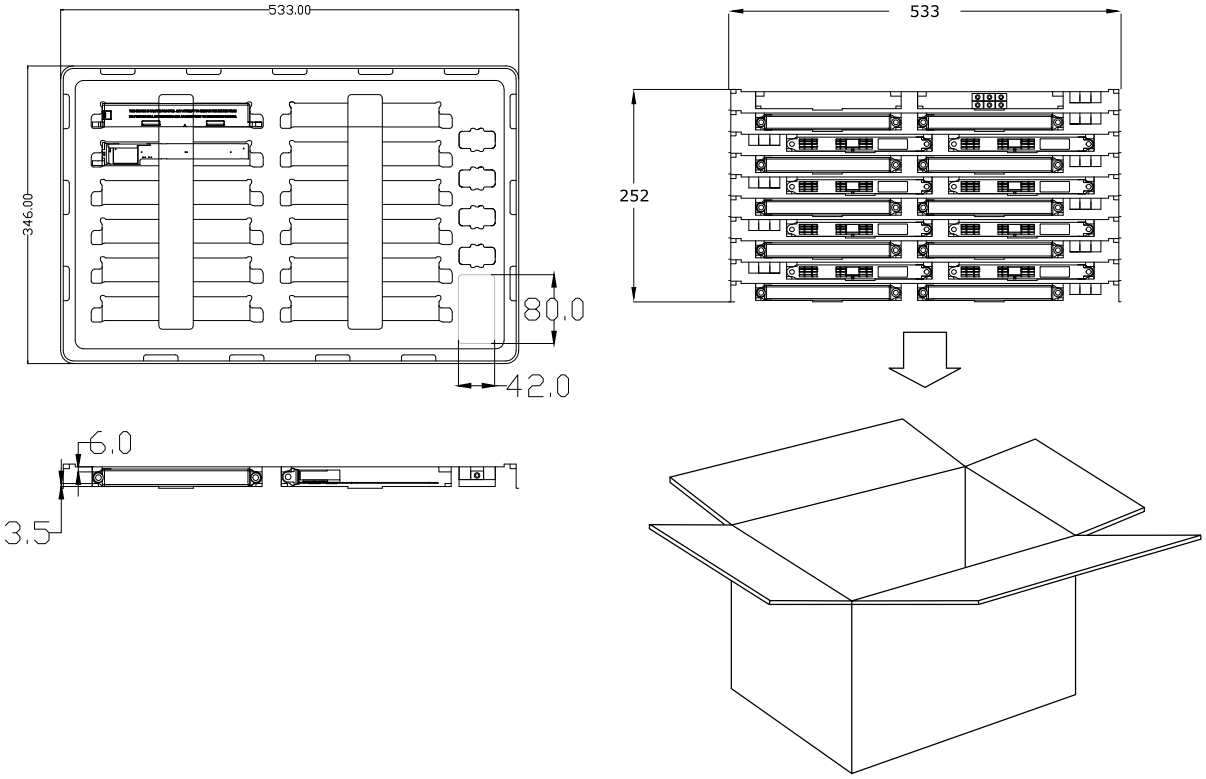


7. Enclosure

8. Dimension : 197mm X 20mm X 27mm
9. Materials : PC (polycarbonate)
10. Color : Black

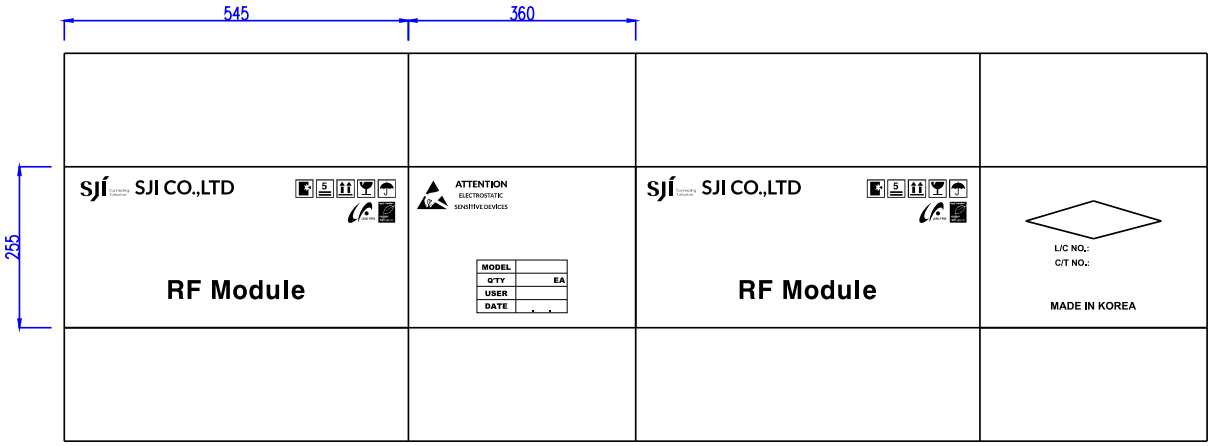


8. Package



1Tray Q'ty : 2*6 = 12EA

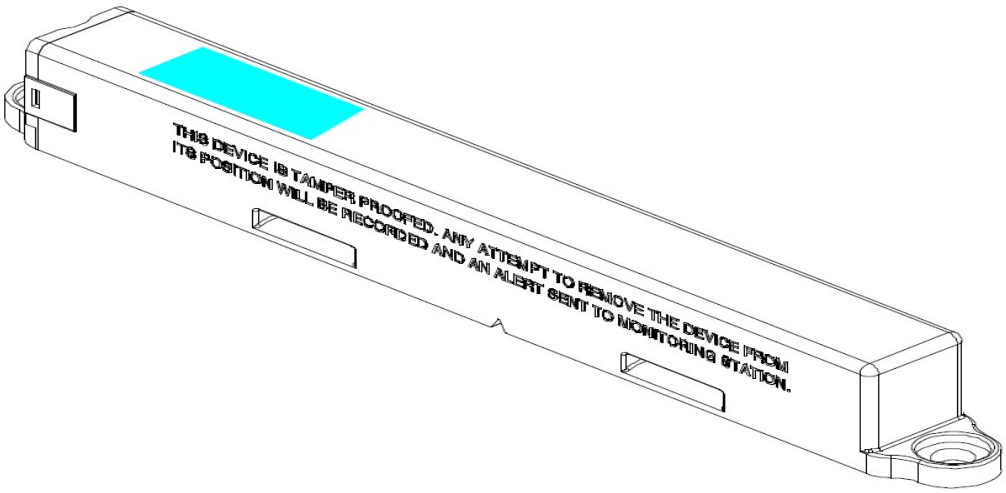
1BOX Q'ty : 9Tray * 12EA = 108EA



9. Getting Started

① The user receives the product set in the shipping mode.
② To activate the product, touch the NFC reader on the top of the product.
③ It takes about 10 seconds to activate the product.
④ After activation, you can connect to the product through the provided APP.
⑤ When connected to the product, Sigfox ID, Sigfox PAC and BT MAC can be obtained, and scenario operation is also possible.

NFC antenna is built in the blue marked part in the picture below.



10. Battery information

- The battery can be replaced by opening the product.
- It is often damaged during the battery replacement process, so please work with caution.
- Before installing the battery in the product, be sure to check the battery and the polarity indicated on the product.
- Observe that there are no problems with the appearance of the battery.
  Since all parts of the battery except the (+) terminal are negative, if the battery vinyl is damaged, the circuit may be shorted, the product may not work, and the battery may overheat.
  If the battery gets hot, remove it immediately.
- If the circuit is short-circuited by inserting the battery with the opposite polarity as indicated, the product may be damaged.

- The specifications of the provided battery are as follows.

Model	ETERNACELL ER14500
Manufacturer	Saft Batteries (Zhuhai)
Material	Lithium-thionyl Chloride (Li-$SOCl_2$)
Norminal Capacity	2400mAh
Norminal Voltage	3.6V
Size	AA

- Be sure to use a lithium thionyl chloride battery with a nominal voltage of 3.6V.
  We recommend ETERCACELL's ER14500, SAFT's LS14500 and EVE ENERGY's ER14505.
- Battery life can vary greatly depending on the operating scenario of the product and the temperature of the installation site.

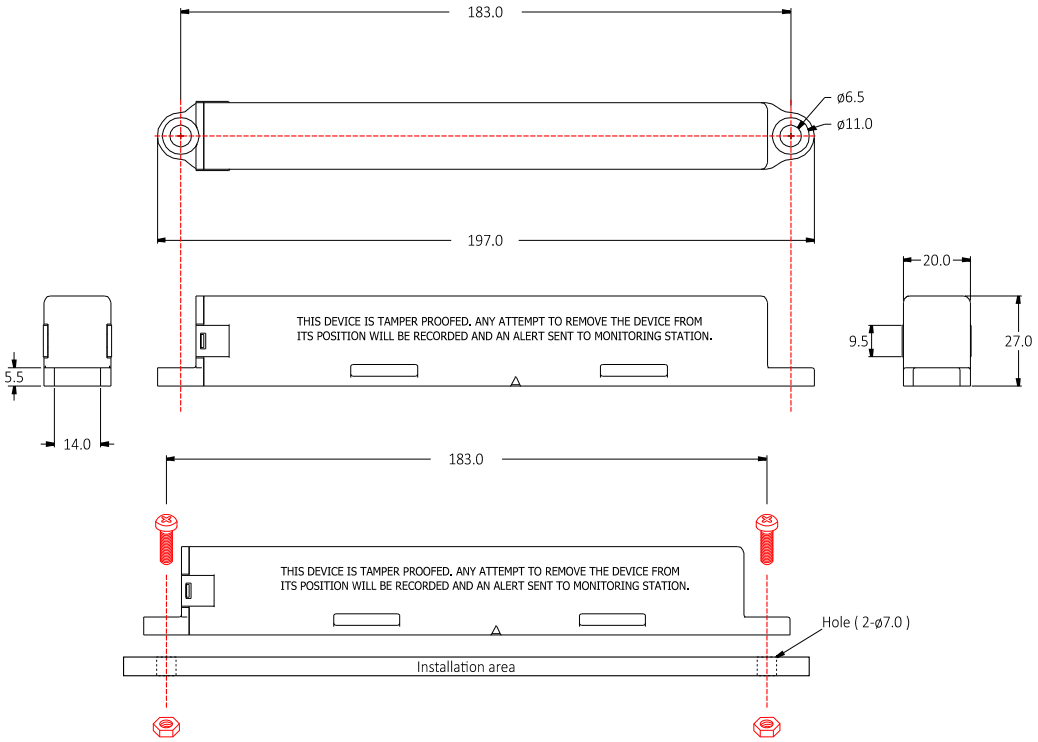
11. How to install

*** Depending on the installation location and installation method, wireless performance may be affected and the device may be damaged. Therefore, it is advisable to inquire in advance about the installation method.**

- Using the device's fixing hole

- Install the product on a flat and clean place.
- Be sure to observe the dimensions between the two fixing holes.
- Do not install the product so that it is bent or deformed.
- Screws or bolts must be tightened vertically.
- Tightening screws or bolts with too strong force may damage the device.

  ∇ Recommended torque: 35kgf·cm

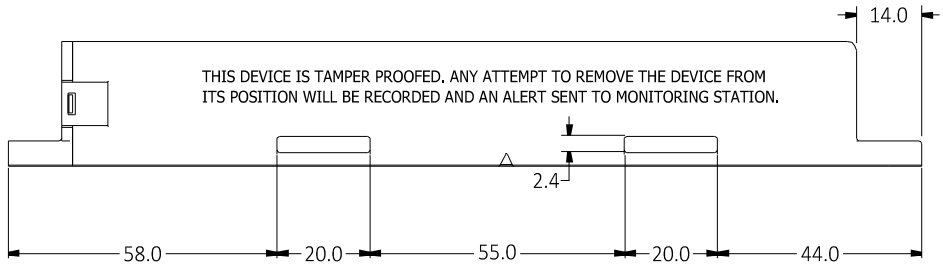


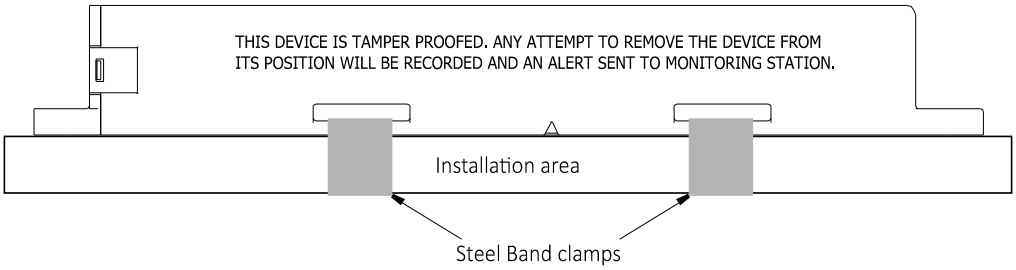
If you are installing on a hard surface such as a steel plate or wall, see additional instructions below.

- When using screws, use Bind-Head M6.0 X 12.0 and install after machining M6.0 machine thread taps.
- If it is difficult to accurately adhere to the 183.0mm dimensions, drill M4, M5 machine holes.
- Do not drill and install at the same time. (Strong torque and sludge will destroy the product.)
- If you can't machine threaded taps, use bolts and nuts.
- If bolts and nuts are used, drill 7-pie holes in the installation area at 183.0mm intervals.
- There is also a way to use a bracket.

- Using the device's slots

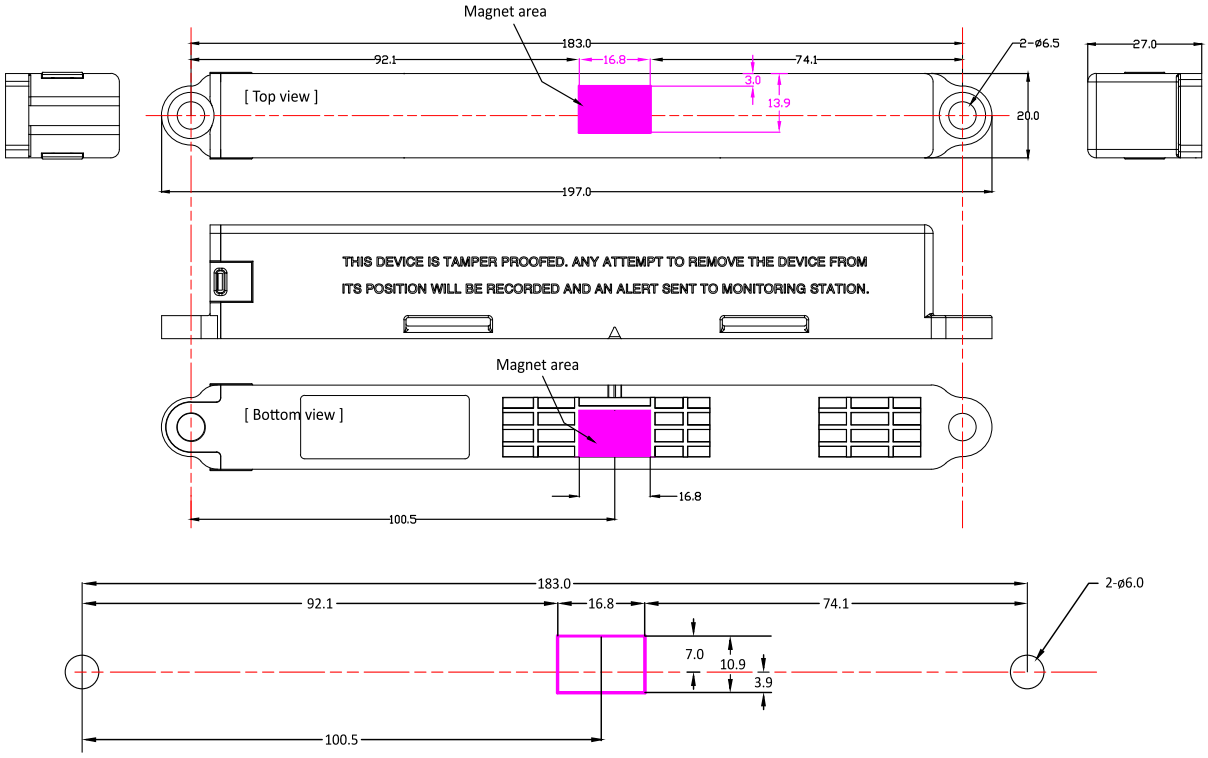
- Install the product on a flat and clean place.
- Fix it to the slot of the product with band clamps or cable ties.
- Please refer to the slot sizes below when choosing a band clamp or cable tie.
- Fix the product firmly so that it does not move.
- If installing additional screws after fastening, work only on soft materials. Further work on hard objects such as steel destroys the product due to torque and sludge.





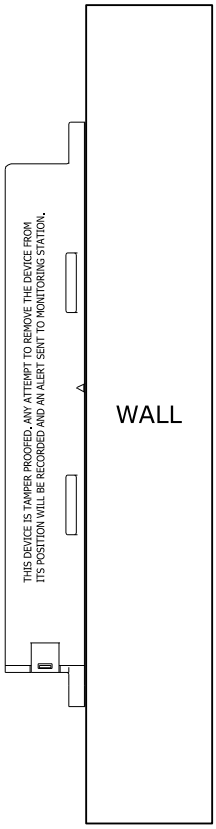
- Magnet installation

- When using the magnet detection function, please refer to the figure below to attach the magnet.
- Dimension of magnet(WxDxH): 15mm x 10mm x 4mm
- Magnet attachment Space: 16.8mm x 10.9mm x 4.5mm

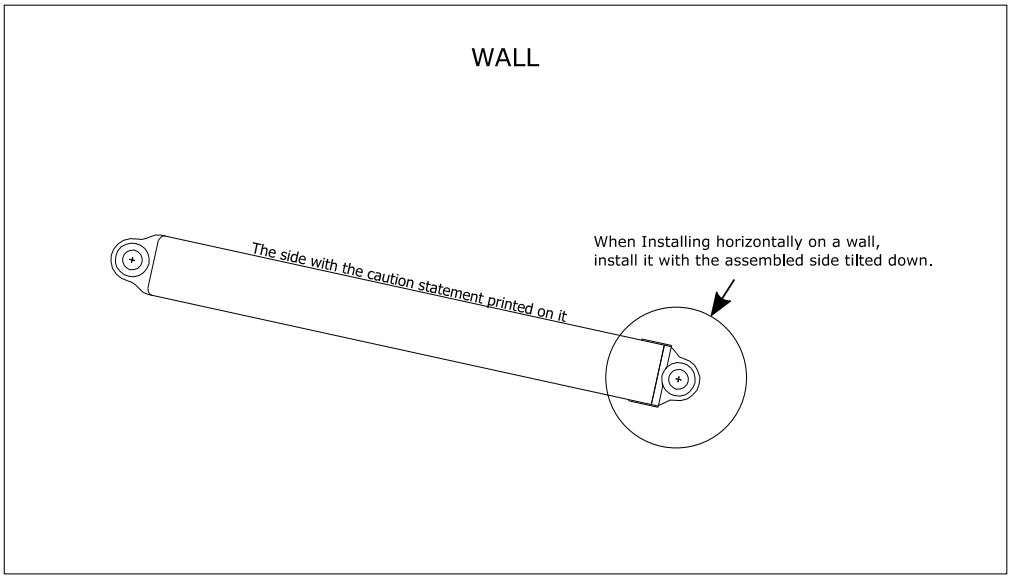


* The supplied neodymium magnets may lose their magnetism due to corrosion caused by moisture, and even under conditions of 60 to 80 degrees Celsius or higher, they may lose their magnetism.
If you have any difficulties with the installation conditions, please contact us.

- Installation Environment Guide



- When installing vertically on a wall, install with the assembled side facing down.
- Avoid installing it on an metal plate or in a place surrounded by metal.
- Wireless performance may be degraded if installed on metal.
- Consider a bracket for installation, as distance from metal can ensure wireless performance.



- When installing horizontally on a wall, install it with the assembled side tilted down.

※ GPS coordinates are best obtained when the caution statement printed side faces the sky.

12. Precautions

- This product supports waterproof function, but may not be waterproof due to damage, wear, random disassembly and reassembly.
- This product may cause radio interference depending on the wireless environment in the installation and operating environment.
- There may be a shaded area of wireless communication.
- Depending on the status of each location service, there may be an error in location information.
- Do not disassemble, repair or modify.
- The battery can be replaced, but we cannot be held responsible for any problems that may arise during disassembly and reassembly.
- If repair is required, contact our CS.
- The life of the product may vary depending on the user's request scenario.
- You can use it for the longest time at 20 degrees.
- As the temperature decreases, the capacity of the battery decreases.

- FCC Certification Notice

FCC ID : 2AS8LIET10MO

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. Warranty

- This product was produced through strict quality control and technical verification.
- The warranty period of the product is 1 year from the date of purchase.
- We are not responsible for product loss due to customer negligence.
- In case of malfunction due to customer's carelessness, repair cost may be charged.
- This product is a wireless communication product, but it does not guarantee the communication distance..

Support	Iot.sigfox@seongji.co.kr
Warranty Term[1)]	1 year from date of purchase
Manufacturer	SJI Co,. Ltd.
Country of manufacture	Republic of Korea

[1)]This is not the meaning of life time to able use this device.
The life time of device is different depending on messages per day.
Especially when the message is sent to Sigfox network every one hour,
the life time can be shorter than one year.

*** The contents of this document may be changed at the manufacturer's discretion, and notification of changes is not obligatory. Get up-to-date documentation with our support team.*

- End of document -