



MOKO SMART



# Product Specification

## *M4 Lite Tag*

*Version 1.0*



MOKO TECHNOLOGY LTD.

# Revision History

Version	Data	Notes	Contributor(s)
V1.0	Aug 31, 2022	Initial version	Daniel

## About document

This **product specification** was designed to help users to know the hardware overview and feature instructions of **M4 Lite Tag** product. Through this document, users will be initial to understand the application scenarios, hardware specifications, basic instructions as well as packaging information of product.

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# 1. Overview

This *Product specification* is mainly applicable for MOKO **M4 Lite Tag** product, and mainly contained below parts:

- [Product brief](#)
- [Application scenarios](#)
- [General specifications](#)
- [Basic instructions](#)
- [Package information](#)

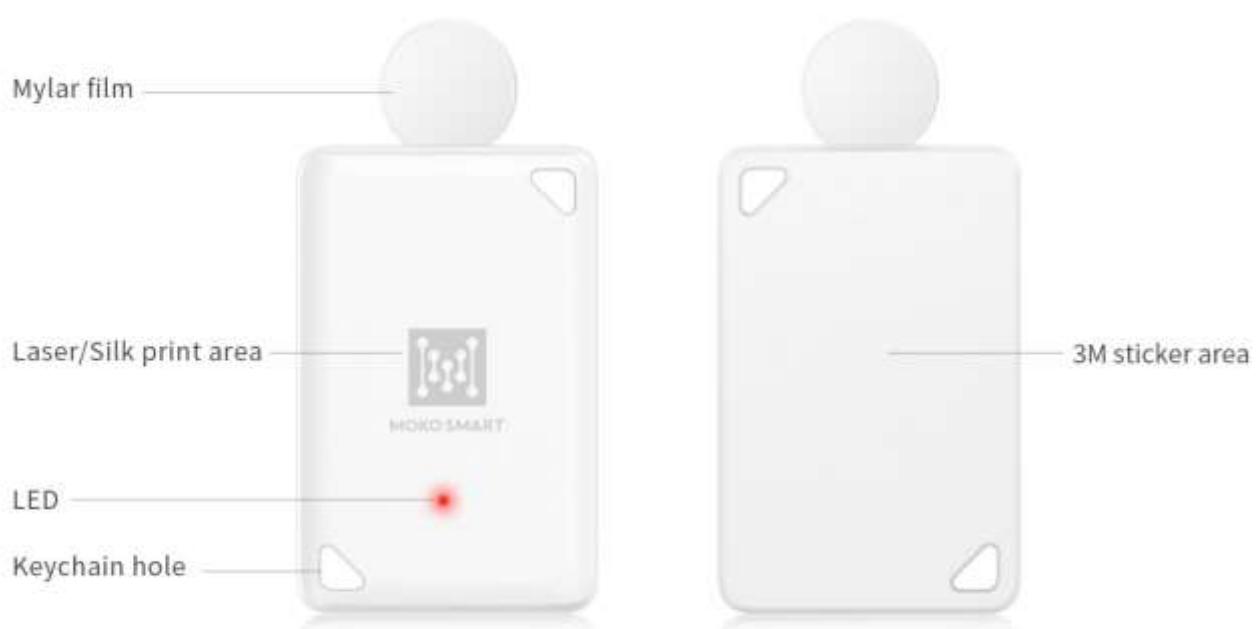
For more information about user guidance of product functions and configuration APP, please contact our sales team directly for official document – “**MOKO Tag APP User Manual**”.

## 2. Product brief

Thin, Lite and Unobtrusive!

The M4 Lite Tag is a small form factor BLE tag. With breakthroughs in cost, distance and sustainability, this tag shall be the best choice for medical equipment tracking, shopping cart tracking and other asset tracking in various scenarios.

Also, M4 Lite Tag has an extremely transmission distance of up to 400 meters based on BLE 5.0 coded PHY settings, thus providing the huge possibility to expand tracking range and reduce the deployment costs of receiver.



**Figure 1:** Appearance overview of M4 Lite Tag

### 3. Application scenarios

#### Healthcare

- Medical equipment usage frequency monitoring
- Asset theft prevention
- Faster positioning of medical equipment in emergency.
- Automate inventory counts



#### Retail & Entertainment

- Shopping cart tracking and real-time queue prediction
- Proximity promotion
- Reliable shoplifting prevention



#### Smart Office

- Office Furniture & Equipment tracking (Desk, Chairs, Photocopier)
- Asset presence detection for theft prevention
- Automate inventory counts



## 4. General specifications

### 4.1 Hardware specifications

Hardware specifications	
<b>Main chip</b>	Silicon Labs BG22 series
<b>Bluetooth</b>	Bluetooth 5.0
<b>Dimension</b>	36.5mm x 23.5mm x 5.2mm
<b>Transmission range*</b>	Up to 160 meters – 1M PHY Up to 400 meters – Coded PHY
<b>Material</b>	PC
<b>Waterproof</b>	Tolerate wiping with wet cloth but not immersion into water
<b>Color</b>	White
<b>Installation</b>	Sticker, Zip tie
<b>Button</b>	N/A
<b>LED</b>	Red LED
<b>Sensor</b>	motion sensor (optional)
<b>Operating temperature</b>	-20°C / + 60°C
<b>Storage temperature (Recommend)</b>	-20°C / + 60°C (without battery) 10°C / + 25°C (with battery)
<b>Operating Humidity</b>	0% ~ 95% (non-condensing)
<b>Antenna type</b>	PCB onboard
<b>Power supply</b>	Coin cell battery CR2032   220mAh   Replaceable

Table 1: Hardware specifications of M4 Lite Tag

\*Transmission range tested in the open area and no obstacles in the route.

### 4.2 Parameter settings

Each M4 Lite Tag has been pre-configured in the factory before the shipment. Here is given the main parameters and default settings in the below.

Software configurations		
Type	Items	Default settings
<b>Supported Adv frame</b>	Apple - iBeacon Eddystone - URL/TLM/UID Customized - Tag info	Slot 1 : Tag info Slot 2 – Slot 6 : No data
<b>Default Adv slot</b>	Default adv slot settings	
<b>Default PHY</b>	Default PHY settings	1M PHY
<b>Slot 1 – Tag info</b>	Tx power	0dBm
	Ranging data (RSSI@0m)	0dBm
	Adv interval	1000ms
	Adv duration	10s
	Standby duration	0s

Software configurations		
	Tag ID	0x00 00 01
	Device name	MK Tag
	Trigger switch	OFF

Table 2: Software configurations of M4 Lite Tag

## 4.3 Battery consumption

Here we have described battery consumptions in some common configurations which refer to different use cases. You can refer to below table to create the use case and estimate battery lifetime.

Battery consumptions - <i>With motion sensor</i>					
Adv type	Tx power	Advertising interval	Consumption (uA)	Lifetime*	
Tag info	0dBm	100ms	152.5uA	1.2 months	
		500ms	36.2uA	5.5 months	
		1000ms	22.6uA	8.5 months	
		2000ms	15.5uA	12.5 months	
		5000ms	11.6uA	17 months	
		10000ms	10.3uA	19 months	
Sleep mode (No advertising)			6.4uA	/	
Power off mode			3.7uA	/	

Table 3: Battery consumptions – with motion sensor

Battery consumptions - <i>Without motion sensor</i>					
Adv type	Tx power	Advertising interval	Consumption (uA)	Lifetime*	
Tag info	0dBm	100ms	135.6uA	1.5 months	
		500ms	31.8uA	6 months	
		1000ms	17.5uA	11 months	
		2000ms	9.7uA	20 months	
		5000ms	5.6uA	35 months	
		10000ms	4.1uA	48 months	
Sleep mode (No advertising)			2.9uA	/	
Power off mode			2.7uA	/	

Table 4: Battery consumption – Without motion sensor

To enhance the understanding of battery lifespan, here we described some practical scenarios for reference.

Battery consumptions – Practical scenarios				
Typical scenarios	Typical working logical	Motion sensor	Consumption (Average)	Lifetime*
Asset presence detection	Advertising every 1 hour or more	No	3.8uA	4 years
Movement-based dynamic asset tracking	High frequency report when moving and low frequency when keep static	Yes	9.5uA	1.7 years

Table 5: Battery consumption – Practical scenarios

- **Scenario 1: Asset presence detection – Office/Museum**

**Purpose:** In some working scenarios, it will only need to report the asset status every 1 hour or even longer, to just confirm the assets are in there or anti-theft purpose.

**Configuration:**

- a) Broadcasting 10s (in case scanning window missed) every 8 hours.
- b) Adv interval 1000ms during 10s adv durations.
- c) Motion sensor is not necessary.

**Lifespan estimation:**

- a) Adv period (average) – 16.7uA
- b) Sleep period (average) – 3.7uA
- >>> Whole period (average) – 3.8uA
- >>> Lifespan estimation – 4 years

$220(\text{mAh}) * 80\%(\text{effective factor}) * 80\%(\text{self-discharge factor}) / 0.0038(\text{mA}) / 24(\text{hours}) / 30(\text{days}) / 12(\text{months}) \approx 4 \text{ years}$

➤ **Scenario 2: Movement-based dynamic tracking (RTLS) – Warehouse/Healthcare**

**Purpose:** In some working scenarios, there will need dynamic advertising mechanism to apply into the real-time positioning. For instance, combination with high frequency report during motion period and low frequency report during static period. It will guarantee the positioning accuracy and decrease battery consumptions.

**Configuration:**

- a) Adv interval in motion status – 1000ms.
- b) Adv interval in static status – 5mins. (Broadcasting 10s every 5mins, and 1000ms interval during 10s adv durations)
- c) Motion sensor is necessary.
- d) 4 hours in moving per day.

**Lifespan estimation:**

- a) Motion period (average) – 22.6uA
- b) Static period (average) – 6.9uA (Broadcasting – 22.6uA, Sleep – 6.4uA)
- >>> Whole period (average) – 9.5uA [Calculation:  $(4 * 22.6\mu\text{A} + 20 * 9.5\mu\text{A}) / 24$ ]
- >>> Lifespan estimation – 1.7 years

$220(\text{mAh}) * 80\%(\text{effective factor}) * 80\%(\text{self-discharge factor}) / 0.0095(\text{mA}) / 24(\text{hours}) / 30(\text{days}) / 12(\text{months}) \approx 1.7 \text{ years}$

\*The lifespan here refers to expected life cycle under the standard 25°C usage conditions.

## 4.4 LED descriptions

Here we have described the LED response status in some common situations.

LED response status		
Scenarios	LED color	Response

LED response status		
Power ON	Red	Blinking for 2 seconds
Device connect	Red	Blinking twice
Power OFF	Red	Solid for 2 seconds
Factory restore	Red	Solid for 2 seconds and then device reboot
DFU upgrade	Red	Blinking during DFU upgrade, and solid for 2 seconds after finished, then device reboot
Low battery	Red	Blinking twice every 10 seconds
LED notification	Red	Blinking once --- Motion triggered

**Table 6:** LED response status in various situations

## 5. Basic instructions

### 5.1 How to wear/install M4?



Figure 2: How to wear/install M4 Lite Tag?

### 5.2 How to power ON M4?

To minimize the size of product as much as possible and suitable for various scenarios, as well to avoid intentional power off actions, the M4 Lite Tag has no reserved mechanical button design. Therefore, we have added “mylar film” to simply power on device.

- **Power ON:** Take the “mylar film” out, and Red LED will keep blinking for 2 seconds to power on.

### 5.3 How to restore factory settings?

There have two ways to restore factory settings.

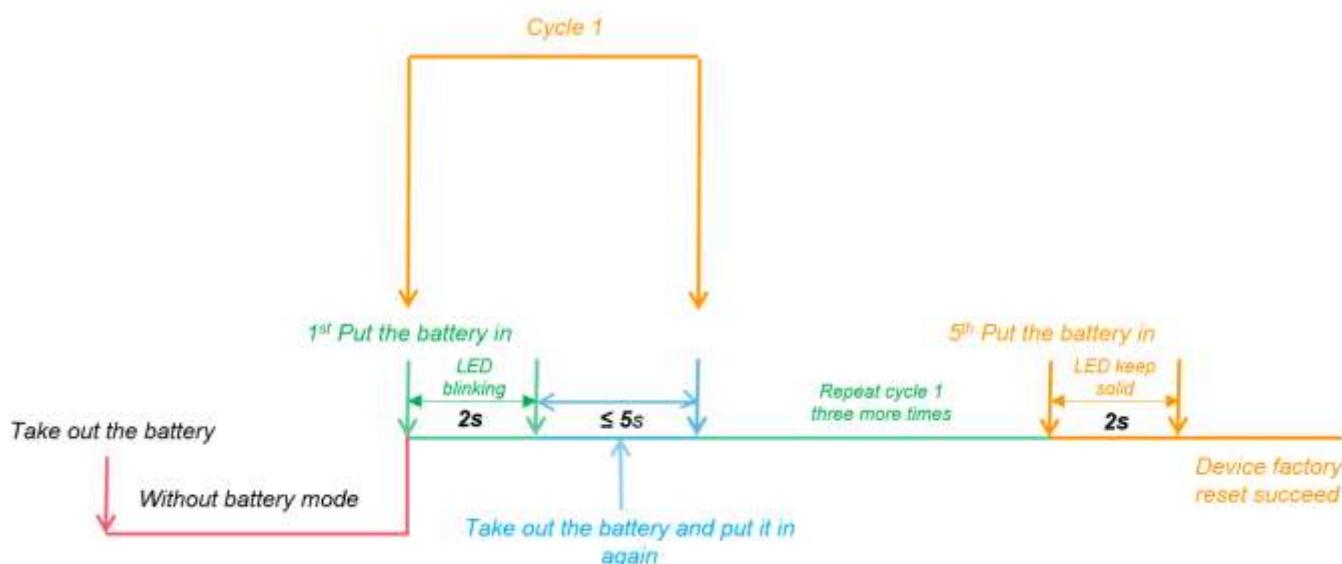
- **Software reset:** Connect with M4 device through “MK Tag” APP and then execute “Settings >> Reset Beacon” operations to finish the software reset.
- **Hardware reset:**
  - 1) Remove the cover and the battery.
  - 2) Put the battery in until you see the LED blinking for 2 seconds. This LED blinking means that the battery is connected successfully.

3) When the LED blinking finishes, put the battery in again **within 5 seconds**, and then repeat the process four more times, removing and replacing the battery. You should see a LED blinking each time you put the battery in, for a total of five blinking. The fifth blinking is different from the previous four and indicates that the device is factory reset successfully.

1<sup>st</sup> – 4<sup>th</sup> : LED blinking for 2s. This indicates the battery is connected successfully.

5<sup>th</sup> : LED keep solid for 2s. This indicates the device is factory reset successfully.

4) Replace the cover by aligning the battery room and press down on the cover.



**Figure 3:** Hardware reset flowchart of M4 Lite Tag

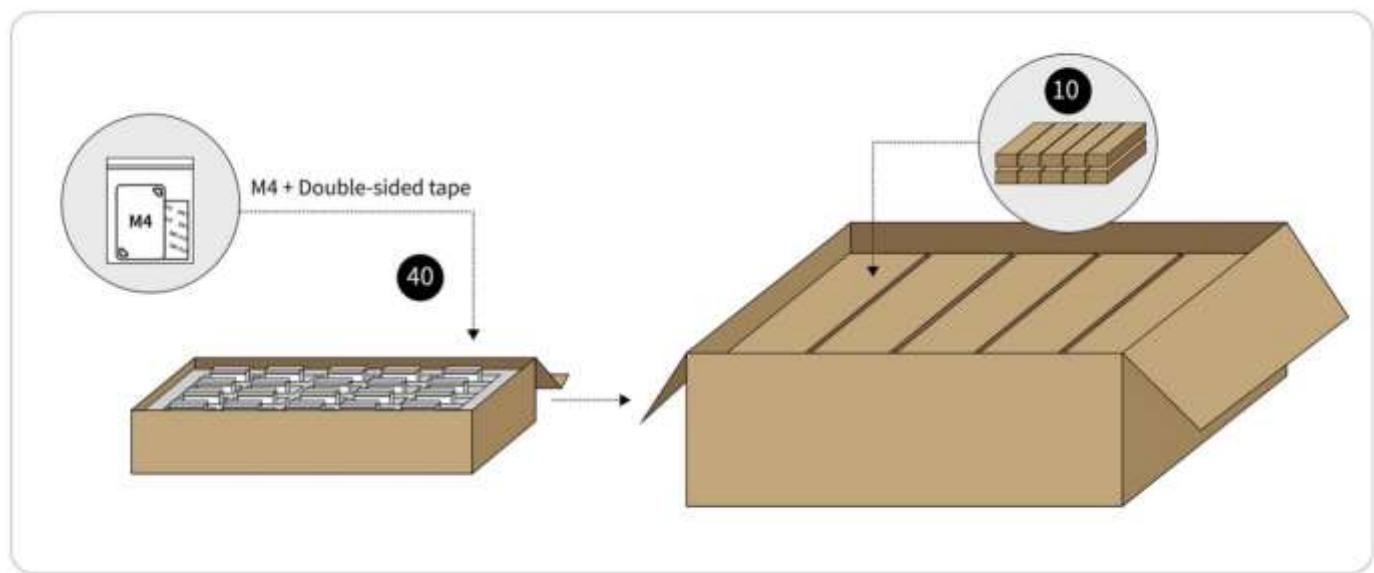
**Remark:** Software reset will not reset connection password.

## 5.4 How to replace battery?



**Figure 4:** How to replace the battery of M4 Lite Tag?

## 6. Package information



**Figure 5:** Packaging information of M4 Lite Tag

Package information		
Item	Inner box	Carton box
Quantity (M4 device)	40pcs/box	400pcs/carton
Quantity (3M sticker)	40pcs/box	400pcs/carton
Size	306*109*72mm	590*320*160mm

**Table 7:** Package information of M4 Lite Tag

## FCC Warning

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.

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

NOTE: 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.

The device has been evaluated to meet general RF exposure requirement. The device can be used in portable exposure condition without restriction.

FCC ID: 2A88A-M4

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