

Inpixon Asset Tag Technical Reference

1.2

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1. Introduction

The Inpixon Asset Tag is an IP65 low-cost and long-range Tag for asset tracking mass deployments. It is designed for RTLS deployments in industrial applications. With the Inpixon Asset Tag we address lifetime requirements of two years or more as well as a long range requirements of 300+ meters.

The Inpixon Asset Tag starts working immediately after activation, with “blink on motion” and “heartbeat messages” while stationary. The tag is designed for asset tracking such as tools, pallets, inventory, carts, trolleys, etc. around locations such as warehouses, factories both indoor and outdoor. The Inpixon Asset Tag is compatible with Inpixon’s RTLS location engine nanoLES. The Inpixon Asset Tag co-exists with other types of tags based on swarm bee or nanoLOC designs.

The location method is based on the nanoLOC chip using Inpixon’s own chirp technology working in the ISM 2.4 GHz band. For a 2D location, it requires a minimal RTLS infrastructure composed with at least four Nanotron anchors and the location engine software nanoLES 3. The location engine can support 10K+ tags.



Figure 1-1: Inpixon Asset Tag (88 mm x 48 mm x 26 mm)

2. Features

Frequency range	ISM-band 2.4 GHz (2.4~2.4835)
Modulation	Chirp Spread Spectrum (CSS)
Transmission Modes	80 MHz, 1 Mbps or 250 Kbps
Typical LOS range.....	300 m
Typical Accuracy indoor	2 m *
Typical Accuracy outdoor	1 m *
RF output power	max.+20 dBm
RF sensitivity @ 80 MHz/ 1 μ s mode	-90 dBm typ.
RF sensitivity @ 80 MHz/ 4 μ s mode	-92 dBm typ.
RF interface	Internal Chip antenna
Supply voltage	Internal Alkaline Battery
Lifetime (default settings)	approx. 2 years
Current consumption before activation ("Flight Safe").....	0 μ A
Operating temperature range	-20°C to +60°C
International Protection Class.....	IP65
Shock Resistance	15 g
Dimensions	88 mm x 48 mm x 26 mm
Weight	78 grams
CE-RED, FCC and ISED (IC Canada) compliant	In progress
ACMA (Australia)	Upon request

* 90%, 1-hour static, 10m distance, RSSI -65 dBm

3. Functional Description

The Inpixon Asset Tag consists of a fully integrated location and communication transceiver, an RF front end, a microcontroller and a triaxial acceleration sensor (MEMS) with temperature sensor. See Figure 3-1.

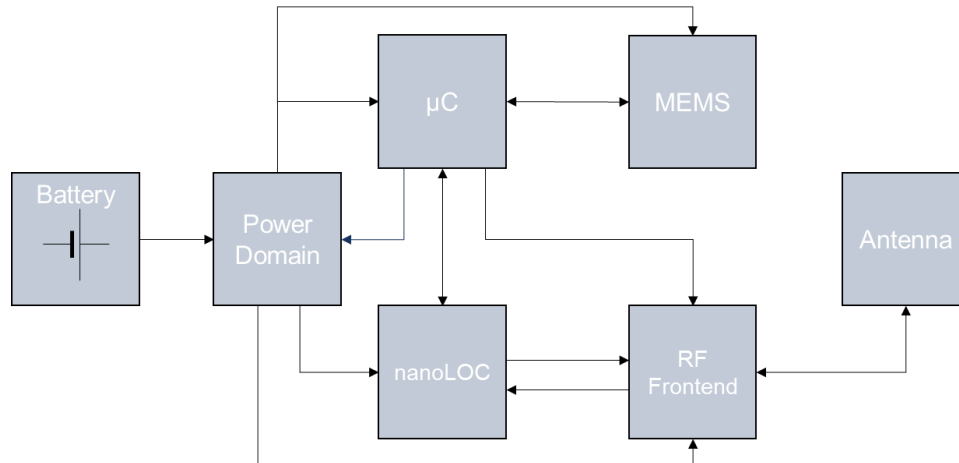


Figure 3-1: Functional Diagram

3.1. Housing

Rugged: IP65 housing resists warehousing and factory dirt and shocks.
The tag can be mounted on nearly any surface with screws or with adhesive strips for wood, metal, stone, and plastics.

3.2. Tag Activation

The Inpixon Asset Tag is activated via a short finger press on the activation button as depicted in Figure 4-1 and stays active for the complete battery lifetime of the product.

3.3. Location Tracking

The location tracking works with Inpixon's anchor infrastructure and the RTLS location engine nanoLES.
The RTLS location engine easily connects with your IoT Platform.

3.4. Scalability

The Inpixon Asset Tag can be integrated with other types of tags, based on swarm bee or nanoLOC, within the RTLS and Inpixon's IoT Platform to scale to 10K+ tags.

3.5. Locating and Sensing

The integrated transceiver (based on the nanoLOC location chip) offers tracking and robust sensor transmission capabilities. It utilises Chirp Spread Spectrum (CSS), the unique wireless communication technology for the 2.4 GHz ISM band from Inpixon.

To establish the location of the Inpixon Asset Tag, it transmits a signal packet called the "BLINK" which provides an efficient RF-packet. The transmission (or update) rate can be configured. The Blink is a ping over the air that identifies the tag. The BLINK is used by surrounding anchors for TDOA measurements. The positions of the tags are deduced from the various air trip times and resulting different timestamps generated by each anchor. The subsequently performed location calculation is done within nanoLES. Besides supporting the location information creation, the

Inpixon Asset Tag sends in each blink a multitude of data consisting of the battery voltage, triaxial low-g accelerations and temperature.



Figure 3-2: Inpixon Asset Tag sends location blinks, battery voltage, 3D-Acc and temperature

3.6. Sensors

The MEMS sensor consists of a triaxial, low-g acceleration sensor including temperature. It is used to detect motion, shocks and can also be used to determine the tilt of an asset.

Acceleration:

- Range..... ±4 g
- Resolution..... 1 mg (sampling @ 12 bit resolution)
- Threshold resolution..... 32 mg @ ±4g
- Max. update rate..... 10 Hz

Temperature:

- Resolution..... 1 °C
- Range..... -20 °C to +60 °C

3.7. Movement Detection

The movement detection is used to increase the battery lifetime. When stationary the tag sends heartbeat messages while in motion it blinks faster to allow real-time tracking. The factory default settings are:

- Motion detection in any direction: 960 mg
- Position updates when stationary: 1 h
- Position updates when in motion: 10 s. Effect is immediate (< 100 ms) once detected
- Fallback time to “stationary”-status: 60 s. After this period, it is checked whether the tag is still in motion. If yes, this check is performed after 60s again.

3.8. Battery

The Inpixon Asset Tag has an alkaline primary cell which lasts with the default settings 1h / 10 s blink intervals and a ratio of 10:1 (stationary vs. motion) for approximately 2 years at ambient temperature (20°C +/- 2 °C). The battery voltage shall be used to detect the end of life of the Inpixon Asset Tag. The battery voltage shall be checked by using the battery voltage field sent in each blink. Refer to the Inpixon Asset Tag User Guide [1]. When the voltage drops below 3.6 V the tag shall be replaced as its functionality cannot be guaranteed. Even if it seems to be operational far below.

Note: Changing any parameter of the Inpixon Asset Tag will have an influence on the battery lifetime.

3.9. Configurability

The Inpixon Asset Tag is normally intended to be used with its default parameters. Those have been chosen to fit for the most use cases. However, if for certain use cases specific parameters need to be changed, it can be done over the air. Refer to the Inpixon Asset Tag User Guide [1] for exact values.

Table 3-1: Configurable parameters via “over the air” (OTA) connection

Description	Default	Min	Max
Slow blink interval in seconds (SBIS) Step in s	1h	1 s	ca. 24 h
Fast blink interval (SBIF) Step in ms	10 s	0.1 s	ca. 2.3 h
Fast blink timeout after motion has stopped (SFTO) Step in ms	60 s	0.1 s	ca. 2.3 h
Motion detection threshold (SMTH). Step in mg	960 mg	100 mg	4000 mg
Comms byte			
FEC	0	0 (OFF)	1 (ON)
RF mode	1	1 (80/1)	2 (80/4)
Sync word	1	0	12

4. Mechanical Dimensions

All dimensions in mm.

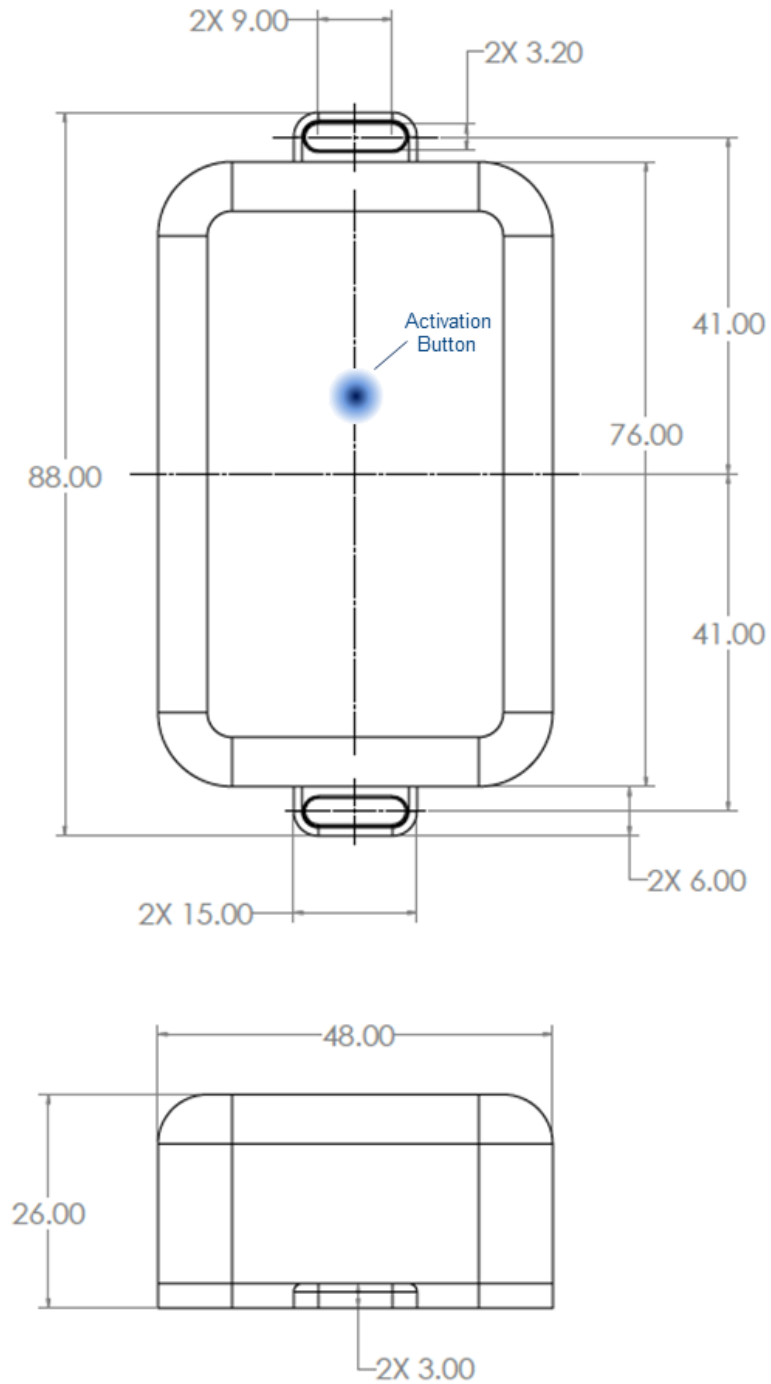


Figure 4-1: Mechanical dimensions of the Inpixon Asset Tag

5. Default settings

Blink interval stationary	1 h*
Blink interval while in motion.....	10 s*
Fallback time from motion to stationary	60 s*
Motion detection in any direction	960 mg*
RF output power	ca. +20 dBm
RF Transmission Mode.....	80 MHz, 1 μ s (*)
FEC.....	Off*
Sync word	1*
CSMA (energy detection)	On

* values are configurable as in Table 3-1

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7. References

[1] Inpixon Asset Tag User Guide Doc. ID. NA-20-1002-0002

Document History

Date	Author	Version	Description
2021-03-04	MBOR/NDZI	1.0	Initial version
2021-05-10	MBOR	1.1	Pictures and tables adapted to the new housing formfactor
2021-05-26	MBOR	1.2	Editorial changes

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