

Inpixon Personnel Tag Technical Reference

Technical Reference

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1. Introduction

The Inpixon Personnel Tag is suitable for a variety of IoT implementations. The small form factor ca. 60 x 34 x 15 mm, the low power consumption, the rechargeable battery via Qi and the eyelet is perfect to be used as wearable tag amongst other applications.

The embedded accelerometer and a temperature sensor make the Inpixon Personnel Tag an ideal choice for personnel tracking products, where indoor location sensing is critical. When deployed with UWB nanoANQ anchors and Inpixon IoT Platform, provide the most comprehensive Real Time Location System (RTLS) on the market today.

Medical device interference: This product contains components and radios that emit electromagnetic fields. These electromagnetic fields may interfere with medical devices, such as pacemakers and defibrillators. Consult your physician and medical device manufacturer for information specific to your medical device and whether you need to maintain a safe distance of separation between your medical device and this product. Stop using this product if you suspect it is interfering with your medical device.



Figure 1-1: Inpixon Personnel Tag

2. Features

Key Frequency Band.....	Channel 5, 6489.6 MHz, BW 499.2 MHz
Radio Data Rates.....	6.8 Mbps
Operational distance	40 m ¹
Accuracy	30 cm
Transmit power density (Ch 5, PRF 16MHz, Preamble 128 bits).....	< -41.3 dBm / MHz
RF sensitivity (as above).....	-93 dBm typ.
RF interface	Internal antenna
Tri-axial Accelerometer	± 2g/ ± 4g/ ± 8g/ ± 16 g
Accelerometer Resolution	12 bits
Accelerometer measurement frequency	1 to 5300 Hz ²
Temperature measurement accuracy (module)	±0.5 °C
Operating temperature range.....	-20°C to +60°C
Battery charging time	max.5 hours
Battery charging temperature.....	0°C to +35°C ³
Waterproof	IP65 ⁴
Dimensions	59.75 mm × 33.50 mm × 15.00 mm
Weight.....	30 g

¹ Line of sight, real world measurement

² Mode dependent

³ The temperature shall not be exceeded. Risk of damage and danger

⁴ If the tag is opened IP rating cannot be guaranteed

3. Functional Description

The Inpixon Personnel Tag is a UWB radio transceiver based on Decawave technology.

The tag supports *The Blink* [1] on Ch 5, PRF 16MHz, Preamble 256 bits (NNT format) and on Ch5, PRF 64 MHz, Preamble 1024 bits (DW format) with two different blink rates. By default, when stationary it blinks at an interval of five minutes whilst moving at 0.5 second. Each blink includes the data of the battery voltage, the current triaxial acceleration and the module's temperature. With those settings, it is operational for ca. 16 hours.

A comprehensive API [3], enables ranging measurements and the adjustment of a multitude of parameters as defined in this API to the needs of each use case. A Firmware update Over The Air (FOTA) [5] capability allows to update the firmware. A Bluetooth functionality can be made available.

3.1. Functional Blocks

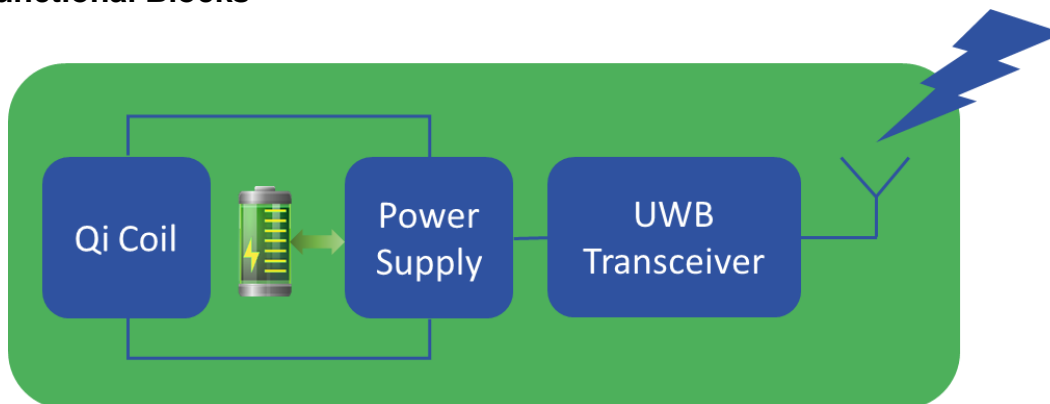


Figure 3-1: Block diagram of the Inpixon Personnel Tag

3.1.1. UWB Transceiver

The UWB transceiver contains a radio chip, a microcontroller and a triaxial accelerometer with temperature sensor. The Nanotron specific firmware enables *The Blink* [1], the API [3], and FOTA [5].

3.1.2. Qi Charging and Power Supply

Qi compatible charging circuitry allows to charge the battery wirelessly. The battery when operated with its default presets allows an operation of the tag for ca. 16 hours. The power supply delivers all necessary power sources within the module.

3.1.3. Acceleration and Temperature Sensor

The on-board MEMS sensor is an ultra-small, triaxial, low-g acceleration sensor with digital interfaces for low-power applications. It can detect acceleration changes like shock or movement and is able to measure the temperature. The MEMS sensor is accessible through the API. The temperature can be measured from -30 °C to +70 °C in steps of 1 °C. The MEMS measures accelerations on three axes. The sensitivity, the threshold and other parameters are configurable via the air interface, refer to [3] and [5].

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3.1.4. Interfaces

The Inpixon Personnel Tag has two physical interfaces:

- RF via the internal antenna
- Qi compatible circuitry for wireless charging

3.2. Functions of the Inpixon Personnel Tag

3.2.1. The Blink

The Inpixon Personnel Tag supports Nanotron's Blink. When stationary it blinks at an interval of five minutes whilst moving at 0.5 second. Each blink includes the data of the battery voltage, the current triaxial acceleration and the module's temperature. This blink can be captured by the surrounding UWB nanoANQ anchors to determine its position in conjunction with Nanotron's RTLS platform.

3.2.2. Ranging, and Communication

The Inpixon Personnel Tag features a low power, yet powerful ranging and communication engine. It automates the necessary sequence of steps for Symmetrical Double-Sided Two Way Ranging (SDS-TWR) patented by Nanotron [7].

Communication between Inpixon Personnel Tag nodes and the anchors is possible during ranging or independent of ranging. It is used for instance for the configuration over the air (COTA).

3.2.3. User API

Inpixon Personnel Tag supports an API (Application Programming Interface) [3] which is accessible via the air interface only.

3.2.4. Movement and Temperature Detection

The tag MEMS sensor is accessible to the nanoLES server interface. The MEMS can further be used to save additional power by waking-up the module when detecting movements. Further the blink rate can be adjusted depending on whether the module is moving or not. Moreover, the threshold between stationary and motion can be set by means of the air configuration process.

3.2.5. Firmware Update

The tag supports firmware update over the air interface (FOTA). See section 5.

4. Configuration Over The Air (COTA)

There are three methods to configure the Inpixon Personnel Tag over the air.

- With a self-written application using a *swarm* bee ER, *swarm* bee ER DK+. The protocol to be used is explained in the section AIR protocol of the API 3.0 User Guide [2].
- With a self-written application using the backchannel of a nanoANQ ER. The use of the backchannel is explained in the nanoLES 3 User Guide [8]. It requires also the air protocol which is explained in the section AIR protocol of the API 3.0 User Guide [2].
- With a *swarm* bee ER DK+ board and the OTA configurator application as described in its user guide [6]. It is the easiest way to configure tags as this application offers a comprehensive GUI as well as scripting to automate the configuration of multiple devices. This tool will be available in the future.

5. Firmware update Over The Air (FOTA)

The firmware update over the air interface is the same for the Inpixon Personnel Tag as for the *swarm* bee. Therefore, it is explained in the application note AN0507 *swarm* bee Firmware Update [5].



Figure 5-1: Typical COTA and FOTA configurations

6. Qi charging device

The Inpixon Personnel Tag can be charged with most Qi chargers. However, it can be possible that certain chargers will not work properly. The following table shows a list of chargers which have been tested in our laboratories.

Manufacturer	Model	Manufactures Part Number	Result	Comments
Belkin	WIA001		Failed	This charger does not work with the Inpixon Personnel Tag
Aramox	TS16	Aramoxc1roz9gdgu	Passed	
ANKER	A2503		Passed	
LETSCOM	SuperP		Passed	Recommended
Limxems	LTD-006	WXC-607	Passed	

7. Disclaimer

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8. Certification

The Inpixon Personnel Tag is RED and FCC certified. It is only allowed to operate it within those regulations.

9. Terms And Conditions, Warranty

All related topics to the Nanotron Technologies GmbH terms and conditions as well as to warranties can be seen and downloaded under the link specified in [9].

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10. Mechanical Dimensions & Landing Pattern

10.1. Mechanical Dimensions

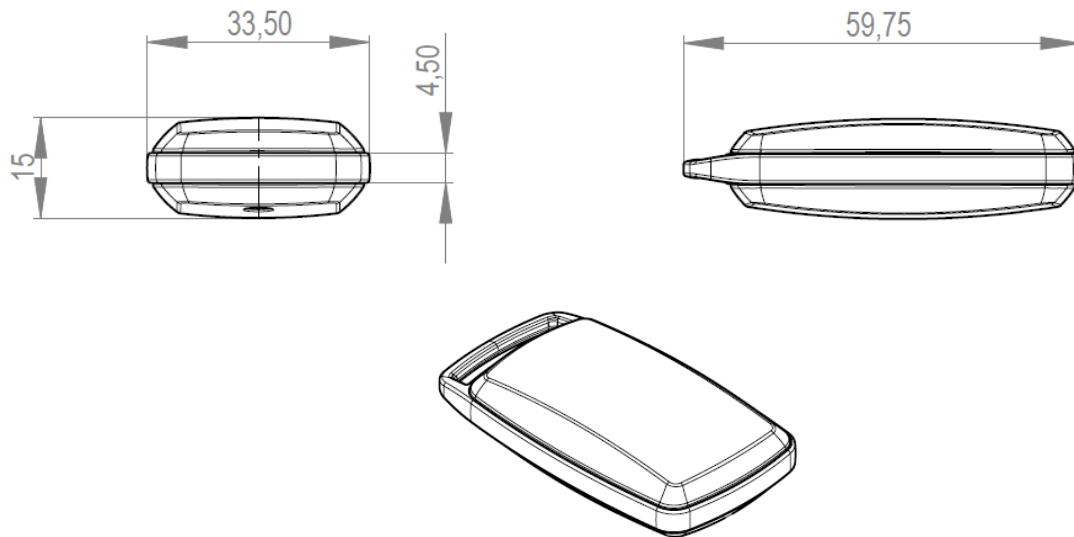


Figure 10-1: Dimensions of Inpixon Personnel Tag

Not to scale

11. Handling

11.1. Packaging

To be provided

12. References

- [1] AN0606-Utilizing Scalable Infrastructure for DW1000-based UWB Tag Hardware
Doc Id. NA-19-1201-0001
- [2] *swarm* API 3.0 Doc Id. NA-13-0267-0003
- [3] Inpixon Personnel Tag User Guide Doc. Id. NA-21-0388-0002
- [4] Release Note Inpixon Personnel Tag Doc Id. NA-21-0388-0001
- [5] AN0507 *swarm* bee Firmware Update Doc Id. NA-14-0267-0017
- [6] OTA Configurator User Guide Doc Id. NA-15-0356-0028
- [7] SDS-TWR Patent, Patent No. US7843379 B2, Nov.30, 2010
- [8] nanoLES 3 User Guide Doc. Id. NA-13-0243-0043
- [9] https://Nanotron.com/EN/or_termsconditions-php/

Document History

Date	Author	Version	Description
2021-03-01	MBOR	1.0	Initial Version
2020-03-29	MBOR	2.0	Production Version

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Nanotron's solutions deliver precise position data augmented by context information in real-time. Location Running means, reliably offering improved safety and increased productivity, 24 hours a day, 7 days per week: Location-Awareness for the Internet of Things (IoT).