

***assetTAG-c* Data Sheet**

0.6

NA-20-1002-0001

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Document Information

Document Title:	assetTAG-c Data Sheet
Document Version:	0.5
Current Date:	2020-08-14
Print Date:	2020-08-14
Document ID:	NA-20-1002-0001
Document Author:	MBOR/NDZI

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1. Introduction

The *assetTAG-c* is an IP65 low-cost and long-range Tag for asset tracking mass deployments. It is designed for RTLS deployments in industrial applications like warehousing, factory and any in- or outdoor tracking of fixtures, tools, pallets, inventory, carts, trolleys, vehicles or robots. With the *assetTAG-c* we address lifetime requirements of two years or more as well as a long range requirements of 300+ meters.

The *assetTAG-c* starts working immediately after activation. With “activation on motion” and “heartbeat messages” while stationary, the tag’s design fits perfectly for warehouse, factory and any in- or outdoor tracking of fixtures, tools, pallets, inventory, carts, trolleys, vehicles or robots. The *assetTAG-c* is integrated in nanotron’s RTLS or Sensera’s IoT Platform. It co-exists with other types of tags based on swarm bee or nanoLOC designs. The RTLS and IoT Platform can support 10K+ tags.

The location method is based on the nanoLOC chip using nanotron’s patented chirp technology [1] working in the ISM 2.4 GHz band. It requires at minimum an RTLS infrastructure, that means four nanotron anchors and the location engine software nanoLES 3.



Figure 2 assetTAG-c (94 mm x 43 mm x 14 mm)

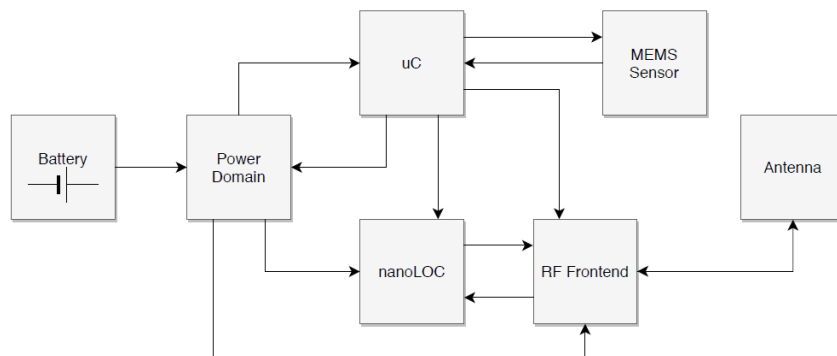


Figure 1 Functional Block Diagram

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.....	+20 dBm
RF sensitivity @ 80 MHz/ 1 ms mode.....	-90 dBm typ.
RF sensitivity @ 80 MHz/ 4 ms mode.....	-92 dBm typ.
RF interface.....	Internal Chip antenna
Supply voltage.....	Internal 3 V Lithium Battery 950 mAh
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.....	93.6 mm x 43.3 mm x 14.0 mm
Target dimensions (est.).....	50 mm x 35 mm x 20 mm **
Weight.....	40 grams
RED and FCC compliant.....	Certified **
ISED (IC Canada) and ACMA (Australia).....	designed to comply to **

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

** Final product

3. Functional Description

The *assetTAG-c* consists of a fully integrated location and communication transceiver, a RF front end, a microcontroller and a triaxial acceleration sensor (MEMS) with temperature sensor.

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 *assetTAG-c* is activated via the activation button as depicted in Figure 4-1 and stays active for the complete battery lifetime after this procedure.

3.3. Location Tracking

The location tracking works with by using IoT Stack which includes the anchor infrastructure as well as a multilayer IoT Platform providing the location engine nanoLES, an RTLS Bridge to connect the hardware with the cloud based upper layers for analytics and data presentation and configuration.

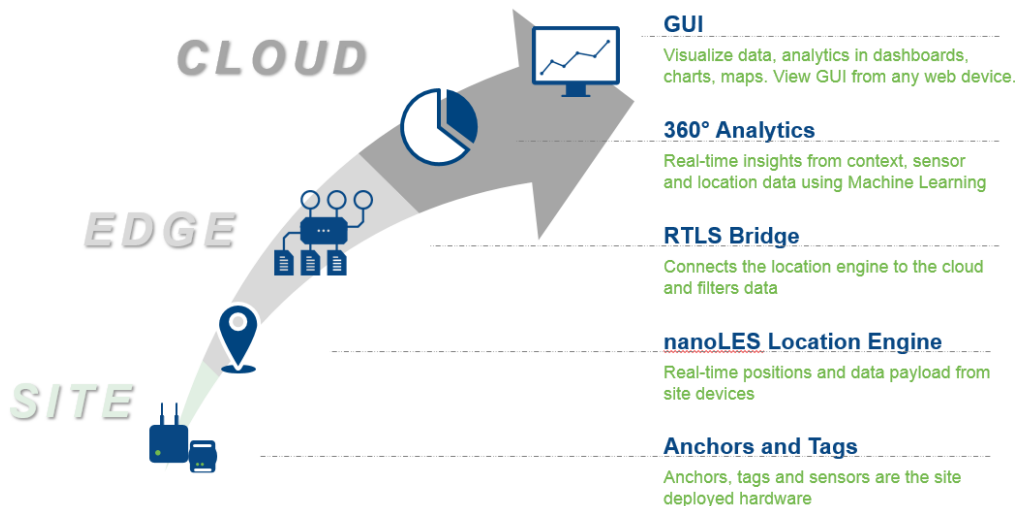


Figure 3 *assetTAG-c* is fully integrated into the IoT Stack Architecture

3.4. Scalability

The *assetTAG-c* can be integrated with other types of tags, based on swarm bee or nanoLOC, within the RTLS and Sensera'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 utilizes Chirp Spread Spectrum (CSS), the unique wireless communication technology patented by nanotron [1] for the 2.4 GHz ISM band.

To get located each *assetTAG-c* sends based on the configured update rates a packet - called the "BLINK". This is an efficient ToF RF-packet. The BLINK is like a ping over the air and serves not only to identify its originating TAG but also to timestamp its reception by the different surrounding anchors performing time difference of arrival (TDOA) measures. 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 the IoT Platform at the location engine layer.. Besides supporting the location information creation the TAG sends a multitude of data consisting of the battery voltage, triaxial low-g accelerations and temperature which are transmitted in each blink.



Figure 4 *assetTAG-c* sends location, 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
- Bandwidth..... 10 Hz

Temperature:

- Resolution..... 1 °C

The battery voltage shall be used to detect the end of life of the *assetTAG-c*.

3.7. Movement Detection

The movement detection is used to increase the battery lifetime. When stationary the tag sends heartbeat signals 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 *assetTAG-c* has a 3.0 V Primary Cell which shall last with the default settings 1h / 10 s blink intervals and a ratio of 10:1 for approximatively 2 years.

Note: Changing any parameter of the *assetTAG-c* will change the lifetime of the battery.

3.9. Configurability

The *assetTAG-c* 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 *assetTAG-c* user guide [2].

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

COMMAND	DESCRIPTION	DEFAULT	MIN	MAX
SBIS	<i>Slow blink</i> interval in seconds	3.600 s (1h)	10 s	86.399 s (24 h)
SBIF	<i>Fast blink</i> interval in ms	10.000 ms (10 s)	T.B.D.	86.399.999 ms (24 h)
SFTO	<i>Fast blink</i> timeout after motion has stopped in ms	60.000 ms (60 s)	1000	86.399.999 ms (24 h)
SMTH	Motion detection threshold	960 mg	100 mg	4000 mg
COMMS BYTE	FEC comms mode sync word	0 0 1	0 (OFF) 0 (80/1) 0	1 (ON) 1 (80/4) 12

4. Mechanical Dimensions

All dimensions in mm.

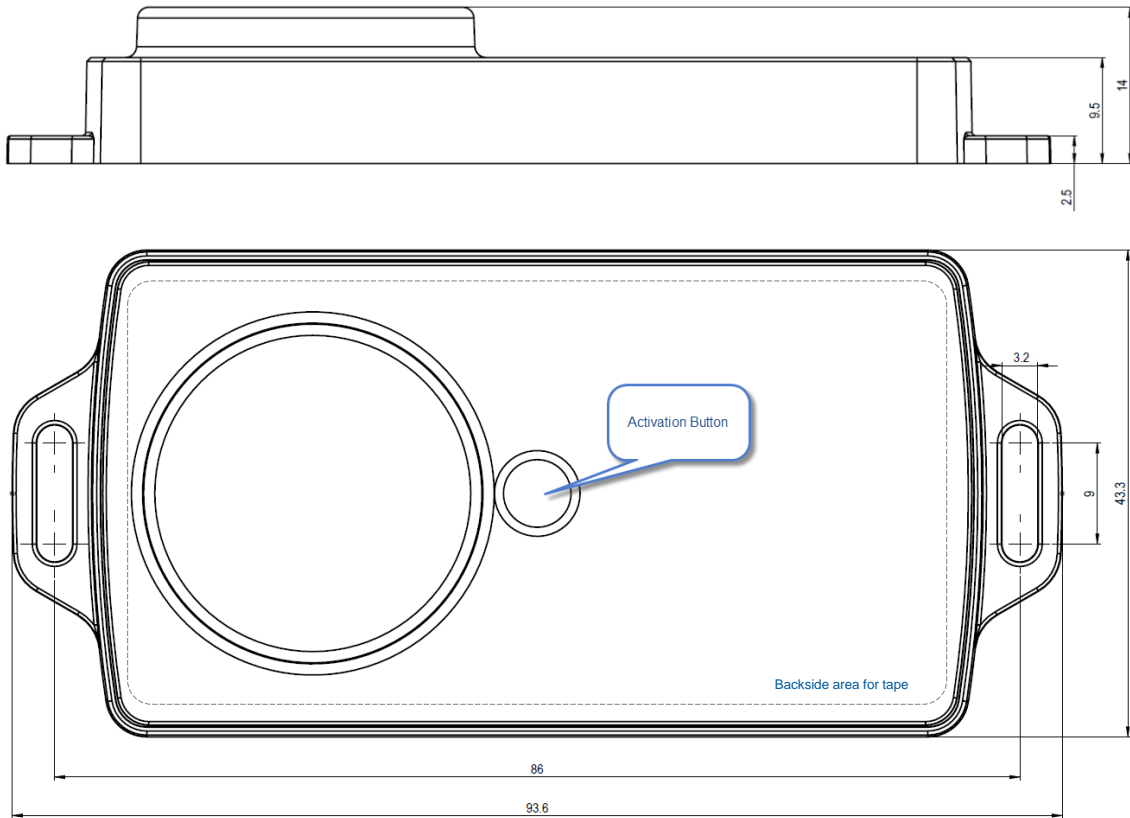


Figure 4-1: Mechanical dimensions of the assetTAG-c

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
Transmission Mode.....	80 MHz, 1 Mbps(*)
FEC.....	Off*
Sync word	1*
CSMA (energy detection).....	On

* values are configurable over the depicted in Table 1.

6. Disclaimer

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7. References

- [1] CSS Patent, Patent No. US6404338 B1, Jun 11, 2002
- [2] assetTAG-c User Guide Doc. ID. NA-20-1002-0002
- [3] nanoLES 3 Real Time Location Engine Product Brief Doc. ID. NA-17-S-0002
https://nanotron.com/EN/su_support_productbriefs-php/
- [4] Sensera IoT Platform Product Brief Doc. ID. SA-19-S000X
https://nanotron.com/EN/su_support_productbriefs-php/

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Document History

Date	Author	Version	Description
2020-06-15	NDZI	0.1	Initial version
2020-06-19	MBOR	0.2	Reviewed, corrected, cleaned-up version
2020-07-03	MBOR	0.3	Refined version from email review
2020-07-17	MBOR	0.4	Drawings with holes dimension
2020-08-xx	NDZI/MOBOR	0.5	Editorial, COTA table

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