afero

Afero Application Note
Proximity-Aware Tag

February 2, 2018 - Version 1.0

1. Introduction

This application note describes using the Afero ASR-1 module to create a tag for proximity-aware applications. A tag is a device that broadcasts a signal and can change location. A beacon on the other hand, stays in a static location. In this application, an Afero Tag is mobile and interacts with the Afero Cloud when it comes within range of an Afero Hub.

The advantage of using Afero for tag applications include:

- The ASR-1 is easy to drop into your design with a low BOM cost.
- Tag data is authenticated and encrypted.
- Tags contain a hardware security module and cannot be cloned.
- Tags communicate with the Afero Platform both through dedicated hubs and soft-hubs included in mobile apps.
- Tags are easy to add to an account simply by scanning a QR code with a mobile app.
- Two-way communication is possible, e.g., the tag can be instructed to do something
- Mobile App and Cloud SDKs are readily available.
- The Afero Cloud is a high-reliability worldwide network capable of handling millions of devices.

Time to market with the above-mentioned features make Afero the ideal solution for all your tag and other IoT projects.

2. Application Overview

Afero powered tags enable approximate position location identification, along with the ability to authenticate the identity of the tag. By contrast, other tag systems cannot provide authentication; e.g., iBeacon can be easily spoofed.

The Afero Cloud tracks device connections and updates the last-known latitude and longitude of a device, based on the location of the last hub that served the tag. This data is available through the Afero mobile app and Cloud API. The hub can be a static dedicated hub or a soft hub running in a mobile app. Further, it is possible to have the hubs not associated with the device accept connections from it. In this way, tags can be located by hubs owned or operated by others. Because the Afero Platform™ uses end-to-end authentication and encryption, the intermediate hub does not have to be trusted yet all communication is secure.

The default Afero mobile app will update the location of the soft hub once at startup; however, a custom app could update it as many times as required.

In addition to the device's position coordinates, the Afero Cloud provides data from any hubs that can see the tag, along with the associated signal strength (known as the RSSI). This information may be used by a Partner to further identify the location of the tag; e.g., by using triangulation. However, it should be noted that the RSSI can vary widely due to causes that have no relation to the distance; e.g., object blocking, radio signal fading, being in a pocket, etc. Therefore, the actual position of the tag may not be possible to calculate.

3. Design Considerations

Afero worked with an outside vendor to build the tag shown in the pictures below. The design takes the following key factors into account:

- Small size
- Coin-cell battery powered
- Bluetooth® low energy broadcast every few seconds
- Potential use as asset trackers (industrial machine/equipment/inventory tracking, tracking + inventory automation for leased restaurant)
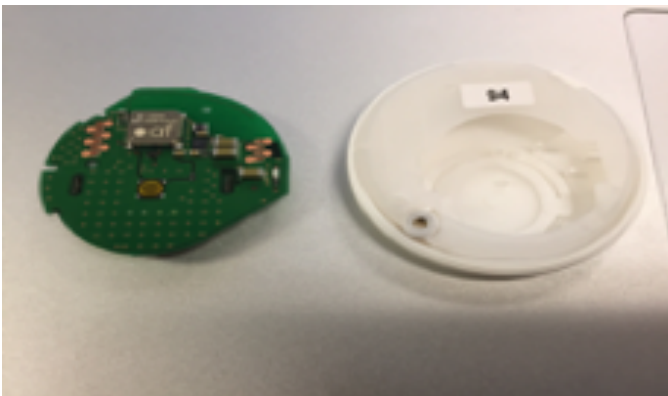
3.1 Schematic
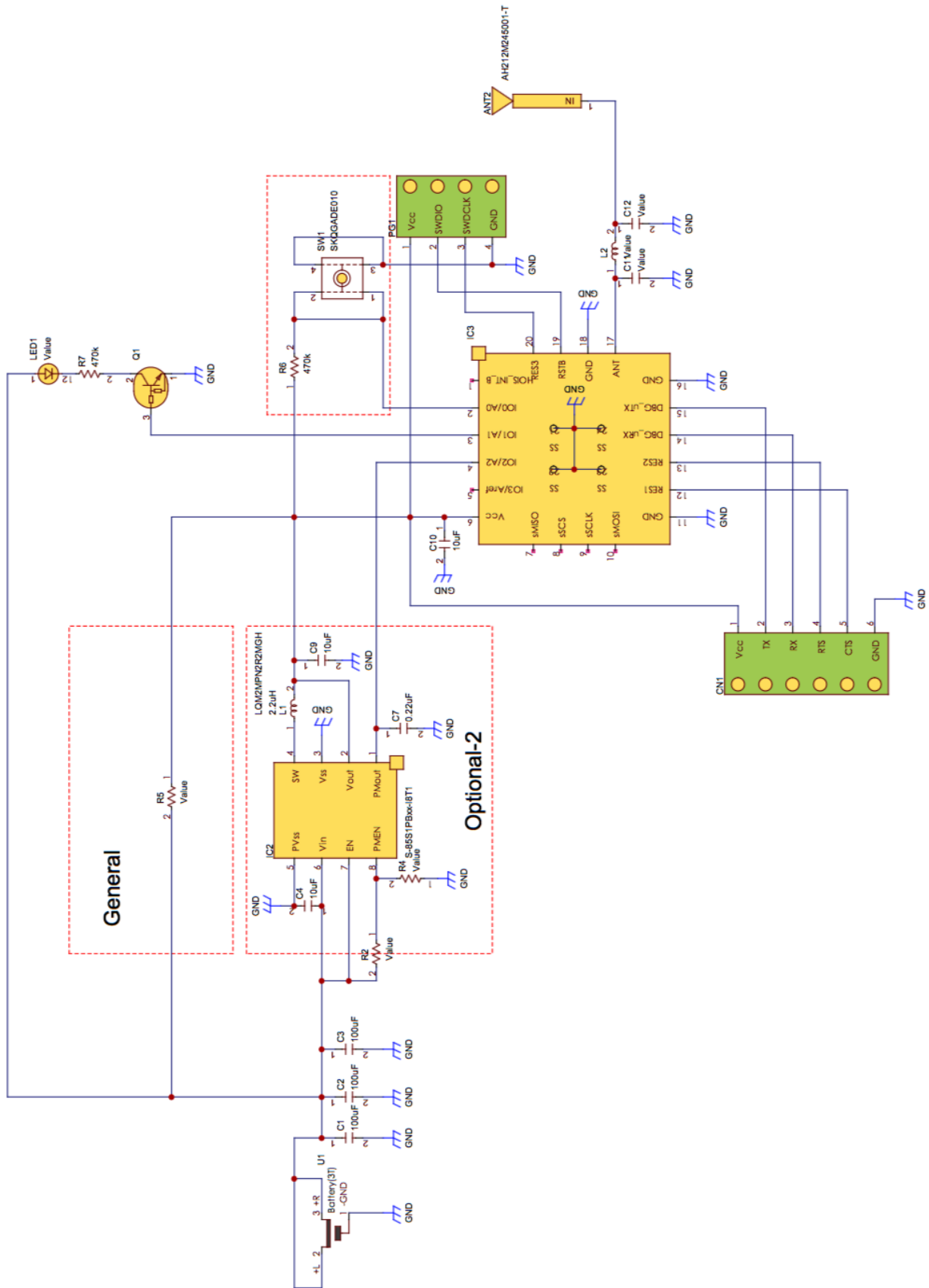
3.2 Bill of Materials

DESCRIPTION	MANUFACTURER	VALUE	PRICE	QTY	SUPPLIER PART NUMBER	COMMENT
C1, C2,C3	Murata Electronics North America	CAP CER 100UF 6.3V X6T 1206	$0.13	3	490-16313-2-ND	
C4, C9	Murata Electronics North America	CAP CER 10UF 4V X5R 0402	$0.02	5	490-10693-2-ND	Optional
C10, C11, C12	Murata Electronics North America	CAP CER 10UF 4V X5R 0402	$0.02	5	490-10693-2-ND	
C7	Murata Electronics North America	CAP CER 0.22UF 6.3V X5R 0201	$0.01	1	490-10406-2-ND	Optional
IC3	Afero	BLE		1	Afero	
IC2	S-85S1P	SWITCHING REGULATOR	-	1	S-85S1P	Optional
L2	Murata Electronics North America	FIXED IND 2.2UH 1.2A 138 MOHM	$0.36	2	490-12072-1-ND	Optional
L1	Murata Electronics North America	FIXED IND 2.2UH 1.2A 138 MOHM	$0.36	2	490-12072-1-ND	
R2, R4	Rohm Semiconductor	RES SMD 470 OHM 5% 0.4W 0805	$0.01	4	RHM470KTR-ND	Optional
R6, R7	Rohm Semiconductor	RES SMD 470 OHM 5% 0.4W 0805	$0.01	4	RHM470KTR-ND	
SW1	E-Switch	SWITCH TACTILE SPST-NO 0.05A 15V	$0.08	1	EG4620TR-ND	
Battery Holder	Keystone Electronics	SMT HOLDER FOR 20MM CELL T&R	$0.45	1	3034TR	