myPIR Sigfox Goodie

User Manual
Alarm system demonstrator based on Sigfox Protocol

ON Semiconductor®

http://onsemi.com

Introduction
With this goodie ON Semiconductor together with 'the things.IO' and Sigfox are demonstrating a real case example on how easy can the AX-SFEU certified single chip solution SoC (API version) be combined with the an NCS36000 passive infrared (PIR) detector to develop an IoT product configurable in few clicks to operating on the Sigfox network.
This product is ETSI and Sigfox certified and comes with MyPIR application (IOS, Android) and an one year Sigfox subscription.
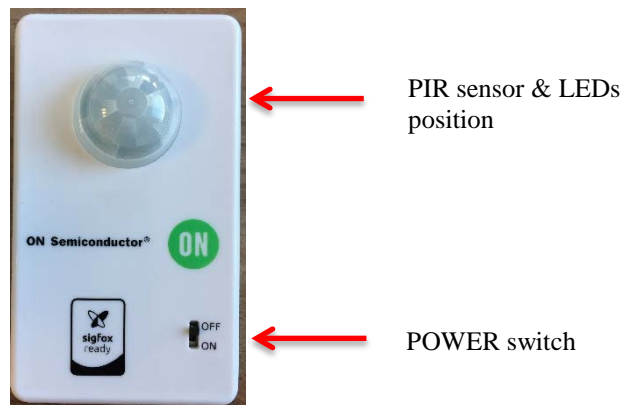

PIR sensor & LEDs position

POWER switch

Figure 1 ON Semiconductor myPIR Goodie

Goodie DESCRIPTION
In order to let the user understand what the Goodie is doing, some visual feedbacks are provided. Thus 3 LEDs are mounted close to the PIR sensor (under the lens). Each LED has a specific meaning, here briefly summarized:
YELLOW: PIR movement detection event.
RED: Sigfox communication in process.
GREEN: result on Sigfox communication.
A micro switch for turning ON/OFF the goodie is also present to prevent any energy consumption when not needed.

SIGFOX COMMUNICATION AND Goodie SW STRATEGY
Sigfox is a network provider and in order to have access to this infrastructure, a contract has to be signed with them. Thus, every goodie is already provided with a subscription for one year that enables up to 140 uplink messages per day.
Since the myPIR goodie could be placed anywhere, in case of a very crowded place the limit of 140 messages could be hit in a very short time. Hence the SW is taking care about this constraint limiting to 6 messages per hour the communication with the cloud.

FIRST POWER UP
When the myPIR goodie is powered up for the first time by toggling the switch from OFF to ON (bottom side of Figure 1) the AX-SFEU-API SW will start to initialize both the RF transceiver and the additional IOs while the NCS36000 controller will start initializing himself. The energy is provided by two AAA battery mounted on the bottom side of the PCB.
The initialization phase is clearly identifiable because the YELLOW led will start toggling at fixed rate for about thirty seconds (NCS36000 initialization) and after approximately ten seconds from power up, the RED led will blink 3 times for overall 6 seconds approximately. The microcontroller is sending a Sigfox message over the Sigfox cloud in order to say

"I'm awake". If the Sigfox transmission library will return with no error, the GREEN led will light on for 1.5 seconds. In case of any error, the GREEN led will fast blink for 2 seconds.
Any further Sigfox transmission is lasting about 6 seconds and is treated always as described.
The message content will be treated in a separate section.
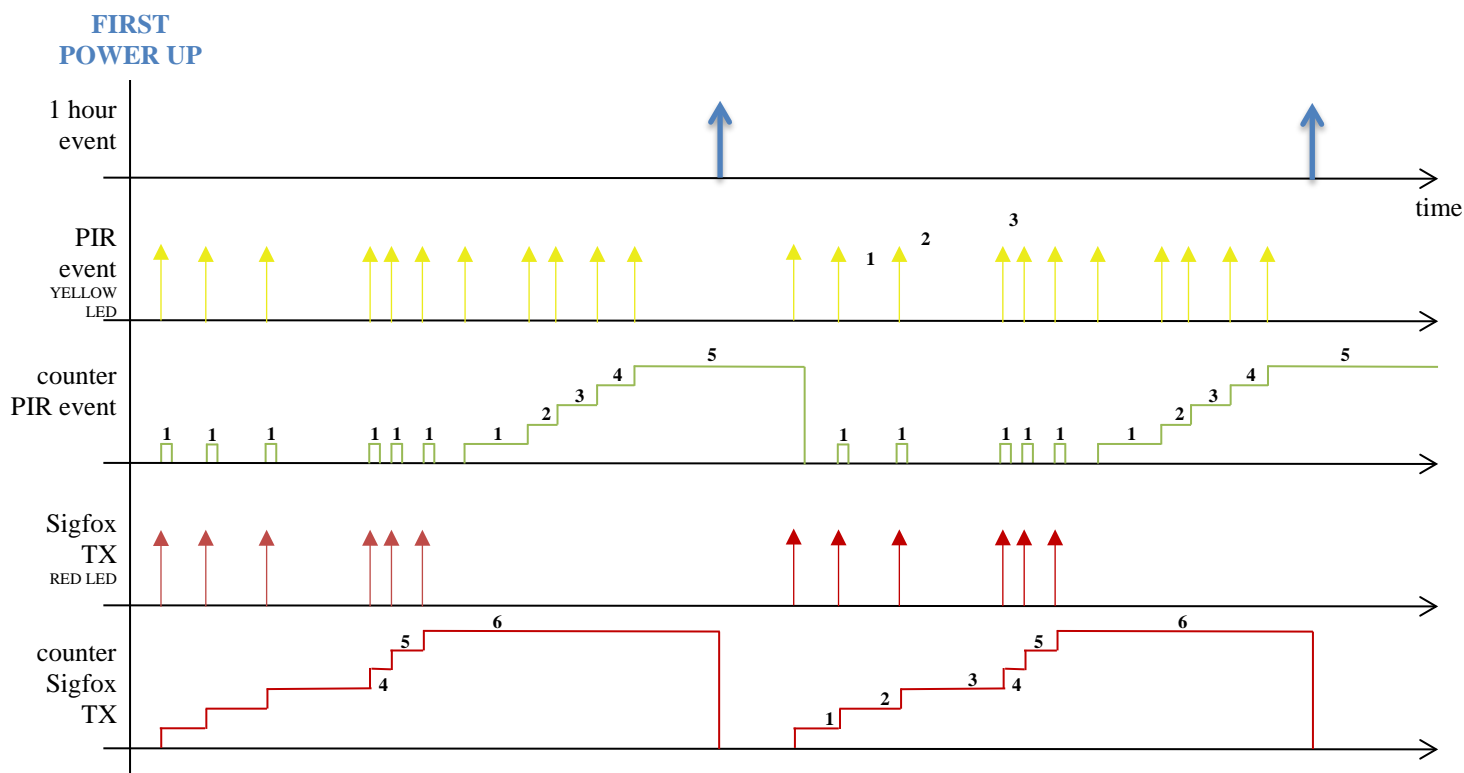
NORMAL OPERATION

As soon as the power up phase is over, if there is no PIR event detected, the goodie is entering in sleep mode. In this condition, the current absorption is around 90 uAmp. This is the sum of the current provided for the microcontroller (sleep mode stage) plus the current for the PIR sensor and the NCS36000 controller (normal mode).
A wake up event is issued as soon as the PIR sensor will have caught a valid movement, therefore the microcontroller will resume from sleep and perform a specific task according to the following situation:

- If the number of messages sent within the hour is lower than six, then send a new Sigfox message;
- If the number of messages sent within the hour reached the threshold, then no Sigfox communication in place but the movement event is registered and added to the counter of PIR events.

An internal timer resource is used for monitoring the one hour elapsing time and whenever it happens, the Sigfox message counter is reset.
For sake of simplicity the following picture will show the Sigfox messaging concept.

myPIR SIGFOX GOODIE

PAIR myPIR WITH THE MOBILE APP

Is it possible to retrieve info about the myPIR alarm system using the myPIR.watch application developed by "thethings.iO".

Each user is linked with only one Goodie.

Here is a list of steps required for reading the Goodie behavior:

1. Place the goodie where you want to start monitoring movements and switch it on.
2. Download the app "myPIR.watch" from the Google Play or App Store. Alternatively it is possible to download it at the following link: http://app.mypir.watch
3. After installing it, a registration is required (SIGN UP).
4. Right after setting the user fields, the app will ask for the code number of the goodie used. This 16 digits number is written on a sticker label on the rear panel of the housing. After copying that value in the app field, the phone/tablet will be paired with that goodie.
5. Toggle the power switch OFF and ON again, the application will show the Sigfox messages sent by the myPIR device.

Technical Specifications

Technical Characteristics
Includes two AAA Alkaline 1.5V Battery
Dimensions (WxHxD): 80 mm x 48 mm x 20 mm

Radio Characteristics
Frequency: 902 MHz (US) and 868 MHz (EU)
Emission Power: 22dBm (US) and 14dBm (EU)

Environmental Characteristics
Temperature Range: -10°C to 50°C
Maximum relative Humanity: 90%

FCC Warning Statements

FCC Interference Statement (Part 15.105 (b))
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 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.

FCC Part 15 Clause 15.21 [Do not Modify warning]:
 "Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment"

FCC Part 15.19(a) [interference compliance statement], unless the following statement is already provided on the device label:
 "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."

FCC RF Exposure Guidance Statement:

"In order to comply with FCC/ RF Exposure requirements, this device must be installed to provide at least 20 cm separation from the human body at all times