RSL10 Smart Shot Camera User Manual

Event-Triggered AI Imaging Platform, Bluetooth® Low Energy Enabled

Description

The RSL10 Smart Shot Camera is a complete node-to-cloud platform that enables smart image capture for portable, low duty cycle IoT applications including asset monitoring and security. Based on the RSL10 SIP and ARX3A0 CMOS image sensor, the platform features multiple trigger modes including time, motion detection, and environmental sensor triggers (e.g. changes in temperature and humidity).

The RSL10 SIP serves as the processing hub of the camera, enabling Bluetooth® Low Energy connectivity of captured image and sensor data to the provided mobile app (available on GooglePlay™, iOS®).

Using the app, developers can access a variety of features including cloud connectivity, remote configuration of sensors (thresholds and default settings), and change the image capture trigger modes. Connected to an Image Analytics/AI engine, located in the cloud, the app is capable of detecting and identifying objects using an AI cloud service. The mobile application returns the captured image, along with the list of identified objects and confidence levels.

The platform features the ARX3A0 Mono 65° DFOV IAS Module, a compact design form-factor used for developing compact cameras with 360 fps mono imaging based on the ARX3A0 CMOS image sensor. ARX3A0 offers high sensitivity at both visible and NIR wavelength, and has a super low power mode that consumes 3.2 mW when active. Additionally, ARX3A0 can be programmed to monitor specific zones of its field of view, automatically taking an image when the scene's contents change. Embedded on the platform hardware, the SPCV1100A from SunplusIT® provides multiple color processing features and JPEG image compression.

The impressive low-power operation of the RSL10 SIP and ARX3A0 is complemented by a dedicated NCP6925 Power Management IC (PMIC) (NCP6925) and additional smart power management modes implemented in hardware. Other devices enabling the efficient power management are the FAN54120 USB-compatible linear Li-Ion battery charger and the FAN49100 ultra-Low Iq buck-boost regulator. Thanks to these features, the RSL10 Smart Shot Camera supports an extended battery lifetime of more than one year.

Related Parts

SECO-RSL10-CAM-GEVB
NCP6925
FAN49100
RSL10 SIP
FAN54120
ARX3A0
ARX3A0 Mono 65° DVOF IAS Module
LC709204F
LE25U20AQG

Applications

Asset Monitoring
Security
Smart Agriculture
Criteria-based Monitoring

Features

- Supports multiple image capture trigger modes
    - Periodic (1 second to 1 minute intervals)
    - Continuous video-like stream with less than 1 frame/s on BLE5.0 and above on compatible mobile devices
    - Proximity detection
    - Acceleration trigger
    - Environment change trigger
- Bluetooth Low Energy connectivity (Bluetooth 5) enabled by the RSL10 SIP
- FOTA (Firmware Over The Air) updates of RSL10 BLE SoC
- Small form Factor (55x65mm)
- Advanced 360 fps imaging provided by the ARX3A0 Mono 65° DFOV IAS Module
    - High sensitivity at both visible and NIR wavelength
    - Super low power (3.2 mW)
    - 1/10” sensor for super compact module
- Auto Exposure feature enabled during image processing
- RSL10 Smartshot Mobile App (GooglePlay™) (IOS®)
    - Cloud connectivity to Amazon Web services (AWS Rekognition)
    - Image Analytics/AI Engine to detect and identify objects within an image
- Unprecedented ultra-low power consumption (Standby and Active Mode) for battery life >1 year
- Multiple powering options (USB or rechargeable Li-Ion batteries)

Benefits

- Portable
- Long battery life (> 1 year[1]) node-to-cloud near turnkey design for reduced development time
- Multiple trigger functions for various use cases

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[1] Depending on use mode

System overview

Fig.1 depictes the system architecture of Ultra low power camera. By default SECO-RSL10-CAM-GEVB evaluation board is delivered with USB cable only (Fig.2) and no re-chargable battery with protection circuit is present.

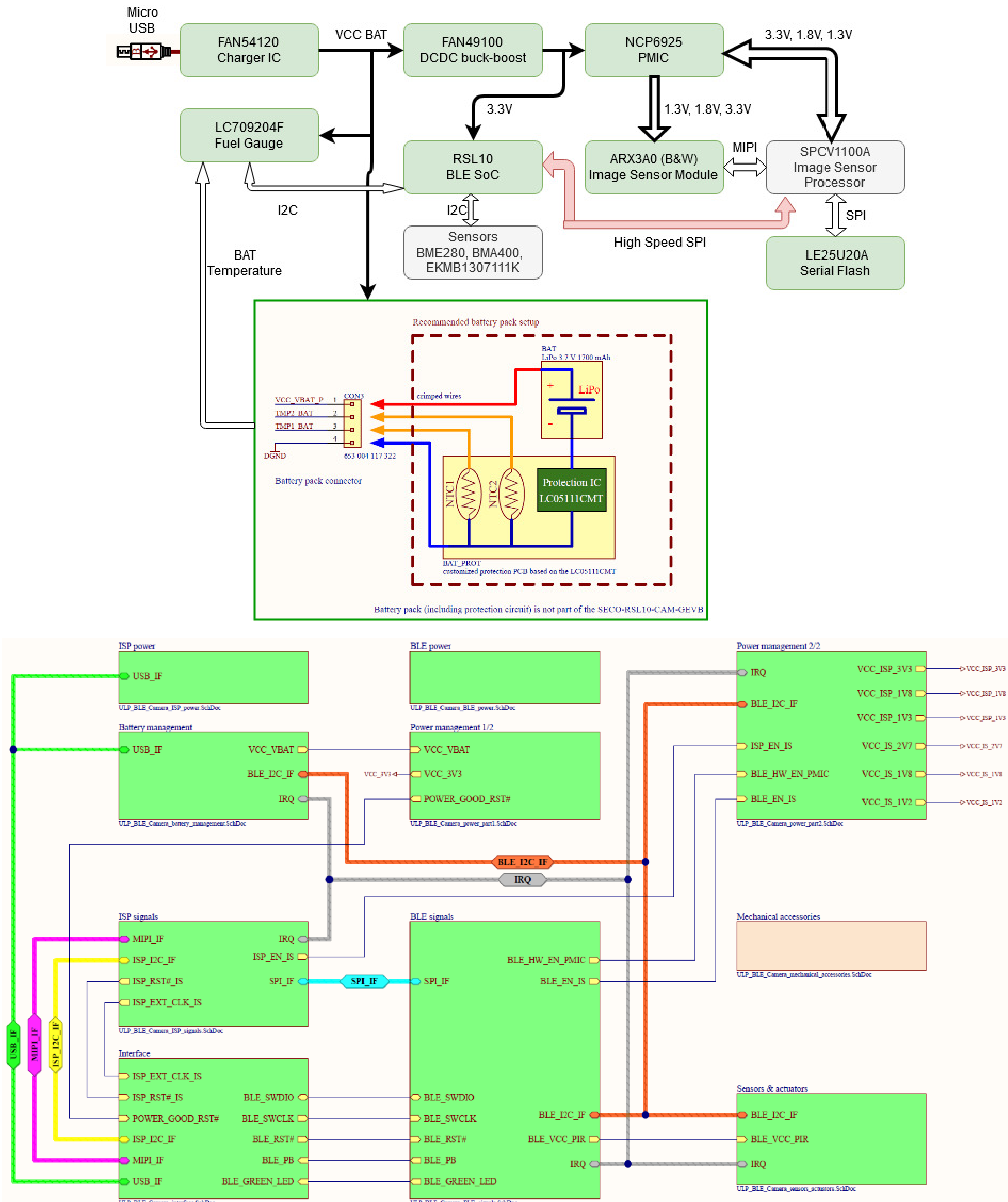


Fig.1 System architecture of SECO-RSL10-CAM-GEVB (Battery protection circuit is optional and not part of the delivery)

Fig.2 SECO-RSL10-CAM-GEVB delivered with USB cable only

The board consists of the following major blocks:

- RSL10 SoC – bluetooth low energy System in package
- ARX3A0 Mono camera – Image sensor module
- SPCV1100A – image sensor processor
- Sensors – BMA400 (accelerometer), BME280 (humidity, temperature), EKMB1307111K (motion)
- Power management – FAN54120 (battery charger), FAN49100 (buck-boost DCDC), NCP6925 (PMIC), LC709204F (Fuel Gauge)

The whole system is powered by unique supply architecture that returns most optimized system performance and low power signature. The board can be supplied by USB cable or Li battery. Li battery is not part of the delivery, but can be added together with Battery protection circuit by customers as described in the follwing chapters.

Entry point of the supply voltage handles USB connection where supply voltage enters battery charger FAN54120. It's used to charge the Li battery if connected and attached to the bottom part of the SECO-RSL10-CAM-GEVB PCB. FAN54120 handles the correct charging profile once Li battery is utilized for standalone camera board operation. Output of the charger controller VCC_VBAT (Fig.1) delivers the supply voltage directly to the low power DCDC buck – boost converter FAN49100 that maintains 3.3V output (VCC_3V3) delivery towards the following ICs:

- RSL10 – low power BLE SoC
- NCP6925 – low power PMIC
- Sensors

The reason of a such arrangement is to utilize the constant supply voltage levels (3.3V) for above ICs when Li battery voltage drops too much during its discharge jurney. Ultra low power buck – boost converter FAN49100 can stabilize 3.3V supply rail (VCC_3V3) whenever input voltage course is within 2.5 – 5.5V.

In case of the delivered board without battery, VCC_VBAT rail after FAN54120, entering FAN49100 always returns $4.2V_{float}$ derived from battery charger controller.

VCC_3V3 rail out of the DCDC converter directly supplies environmental sensor, accelerometer, PIR sensor and RSL10 BLE SoC. All these elements features ultra low power consumption and due to correct system operation, no additional power gating is needed.

The heart of the image processing represents Image Sensor Processor (ISP) SPCV1100A and ARX3A0 camera module. Interconnection between camera module and SPCV1100A ensures high speed MIPI interface. Due to the short peak power delivery needed to process the image in SPCV1100A and overall system consumption savings, supply voltage rails for proper operation of ISP and camera modules ensures ultra low power PMIC NCP6925, featuring highly efficient multi-rail power delivery with typical 300nA current consumption when switched of programatically.

In order to transfer the captured and processed image over BLE channel, dedicated high speed SPI interface between SPCV1100A and RSL10 is utilized. The cooperation between the sensors, ISP, RSL10 and overall power supply management including the mobile app is described in the chapter **ON Semiconductor RSL10 Smartshot Board Support Software Package**.

The arrangement of the particular ICs on the boards id depicted on Fig.3.

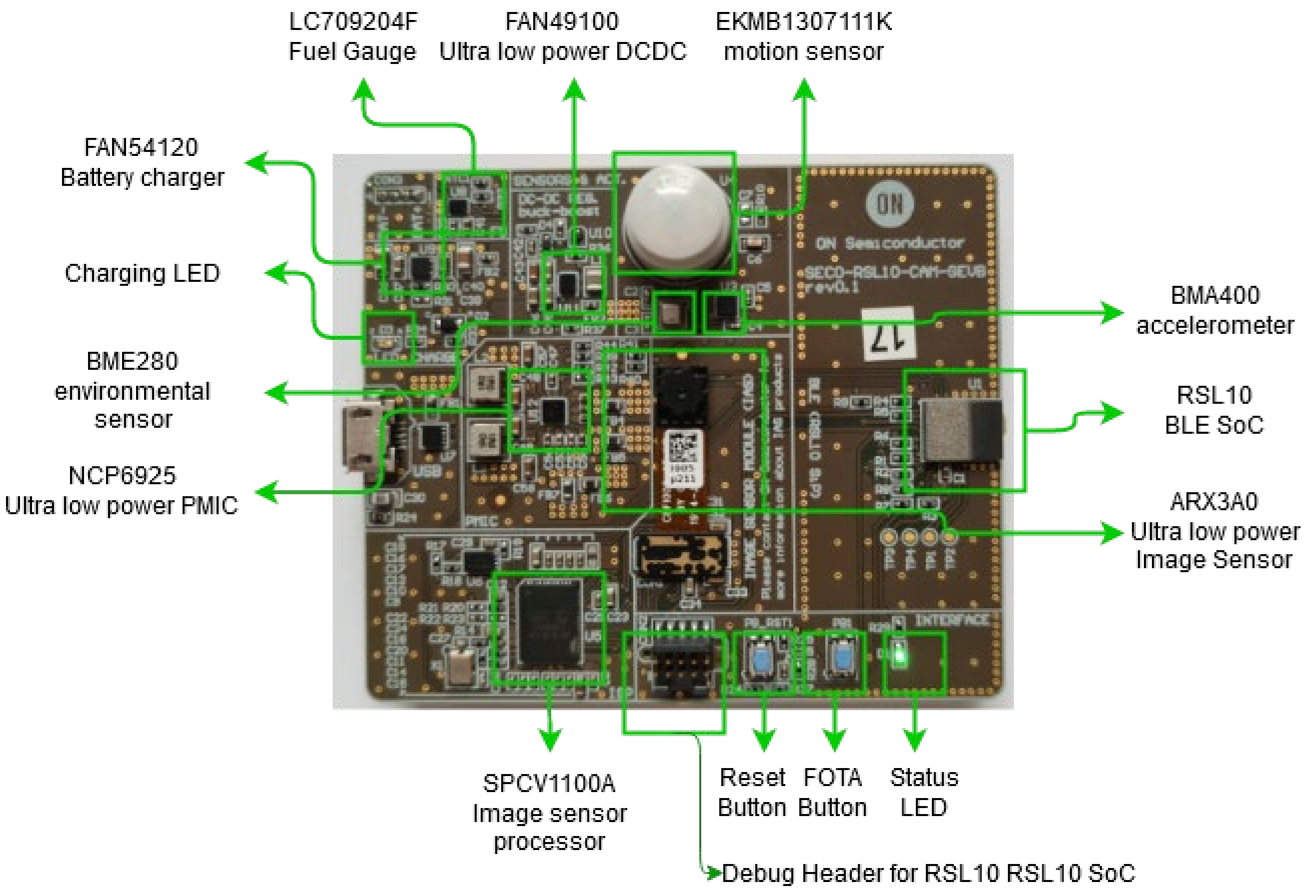


Fig.3 SECO-RSL10-CAM-GEVB componenets placement

Block Diagram

Figures 4 and 5 depicts the detailed block diagram for both power management part and signaling chain within the system.

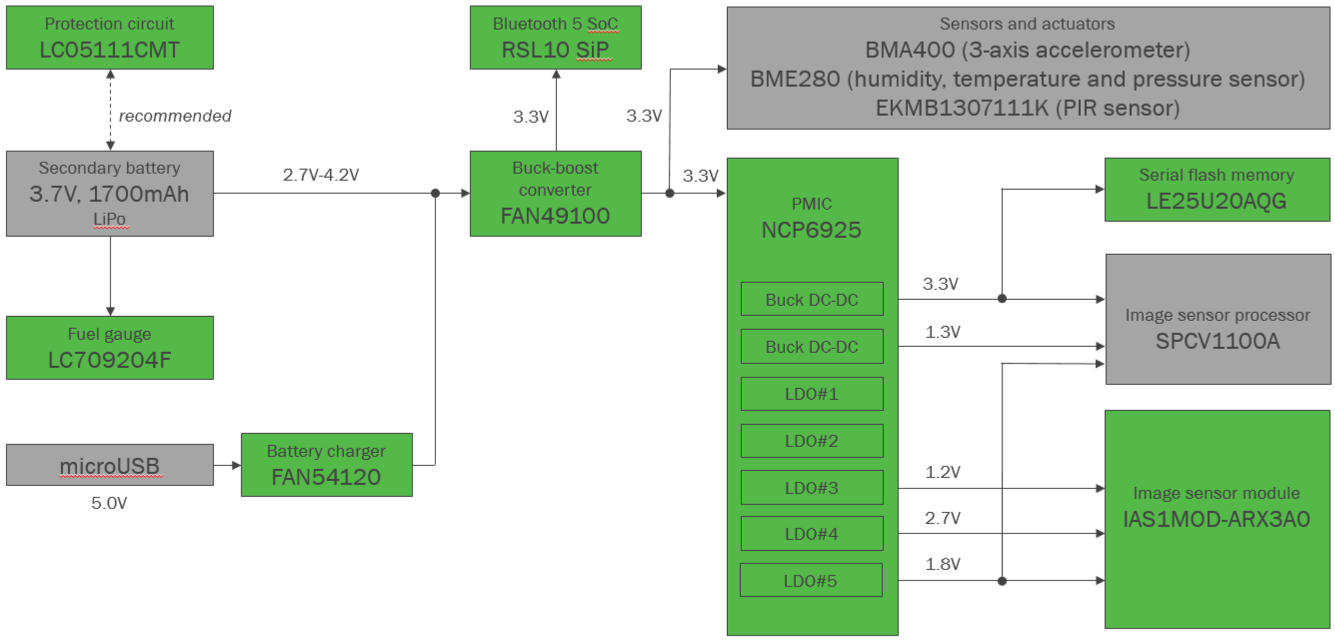


Fig.4 Detailed block diagram of SECO-RSL10-CAM-GEVB (power management part)

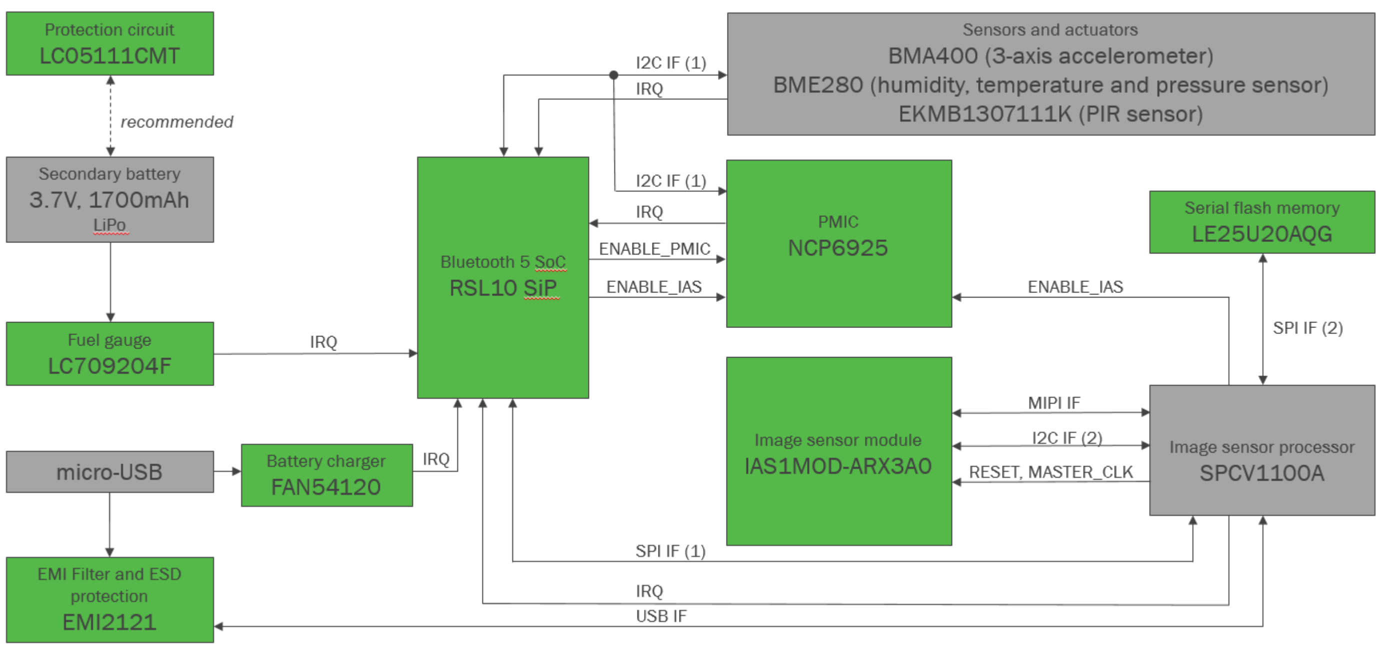


Fig.5 Detailed block diagram of SECO-RSL10-CAM-GEVB (signals part)

Battery and USB supply management

When the re-chargable battery is placed, the charging current is preset to I_{fast} = 400mA (fast charging).

As discussed in the previous chapter, the board is delivered without Li battery. In a such configuration, Battery charger FAN54120 doesn't have to neceserily detect the battery and starting this system without a battery may be a problem. Given a valid USB input, the output of FAN54120 will be active (=V_{float}), even with no battery. Its STAT will be high, since not actively charging. It will support a load up to I_{fast} setting established. Any larger load will collapse the output. When output falls <V_{short}, fault state entered.

If load never exceeds I_{fast}, the output will be active. No need for secondary battery. If load >I_{fast} and battery is not present to supplement load current, it will enter fault state. Because STAT is high, does not automatically mean device in fault state. STAT high can also indicate I_{term} reached, which is the case when no battery installed (assumes load <I_{term}). With no battery and continuous load >I_{term}, STAT would be low. STAT will flip high when load <I_{term} for its de-bounce time (T_{chgend}).

Without battery, safely dragging V_{out} down by V_{rch}, but not to V_{short} (enters fault state) is required to get STAT low. Since load can momentarily exceed I_{fast}, C_{out} needs to be designed to store enough charge to prevent V_{out} collapsing to V_{short}.

The proper selection of FAN54120's output capacitors and additional circuitry in respect to downstream FAN49100 must be arranged, in order to not colapse VCC_VBAT once USB cable is connected and no battery present.

The downstream FAN49100 normally has inrush current well in excess of 400mA. Without a battery, it could crash the system. The FAN49100 ramps its output up in ~200usec. There is typical 44uF C_{out} (not bias derated). The current to charge that cap, with no load, would be close to 750mA. If we reflect that current back to the 4.2V input, its still around 690mA. Obviously, the FAN54120 output is going to collapse.

There is a ~60usec delay from rising EN until output starts ramping on FAN49100. The FAN54120 will not be fully started by that point. It's necessary to add a delay circuit on FAN49100 EN pin so that FAN49100 is enabled after the FAN54120 has started.

Fig. 6 Depicts the reliable way how to safely start the FAN54120 (delay circuit and proper sizing of output capacitors) with respect to downstream power management, if no Li battery is connected to the board.

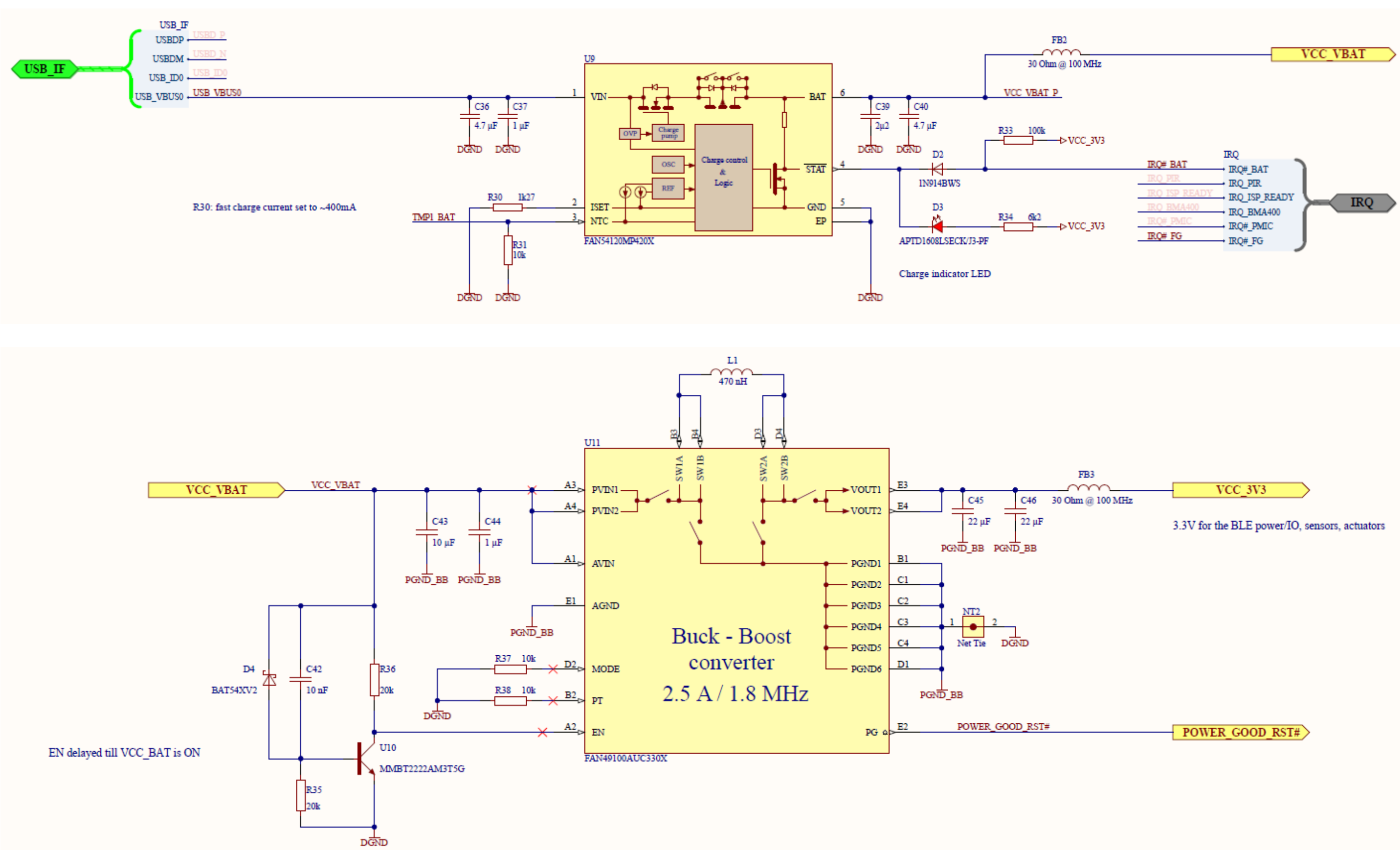


Fig.6 Charger circuit with respect to downstream power management ensures proper start-up when no battery is connected to the system

The consequence of above arrangement and delivery without battery is the following:

1. Once the USB is connected for the first time, red LED D3 blinks once and stays turned off. This indicates that the device started properly. If USB cable disconnected and connected again within the period of less than 10s, D3 will continuously blinking – indicating that FAN54120 didn't start properly. Make sure that plugging the USB cable once un-plugged, happen after at least 10s to allow Battery charger controller start properly (Fig.7).

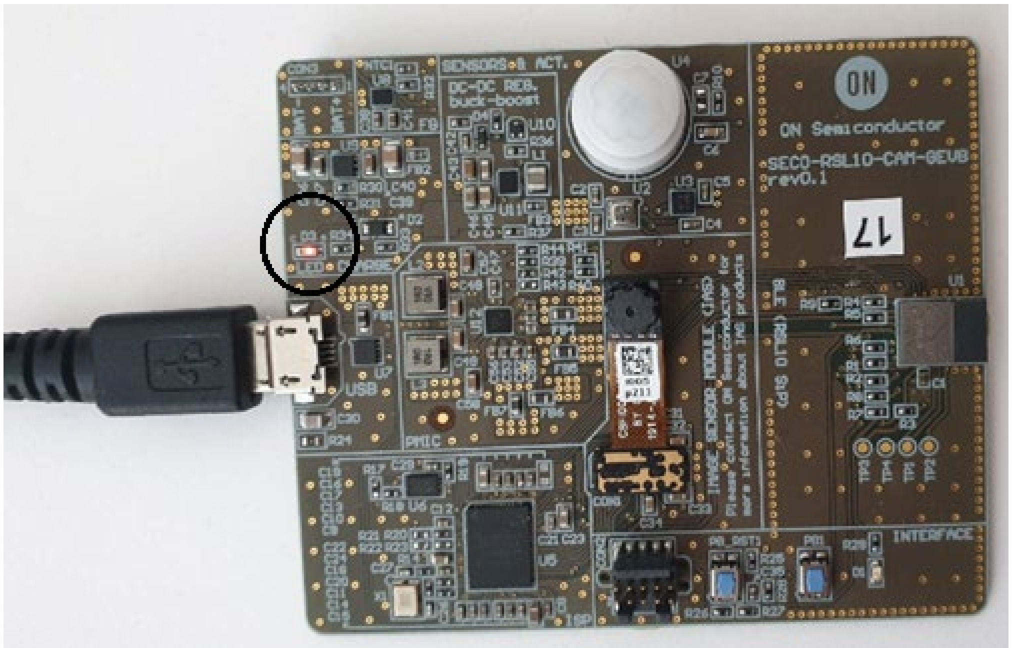


Fig.7 LED D3 continuously blinks (fault operation, FAN54120 didn't start properly). Make sure plugging the USB cable once un-plugged, happen after at least 10s to allow Battery charger controller start properly.

2. FAN54120 requires for its operation the temperature sensing composed of NTC temperature sensor. As the battery isn't part of the delivery, for proper operation of the circuit, 10k resistor in place of R31 provides emulated function (Fig.8).

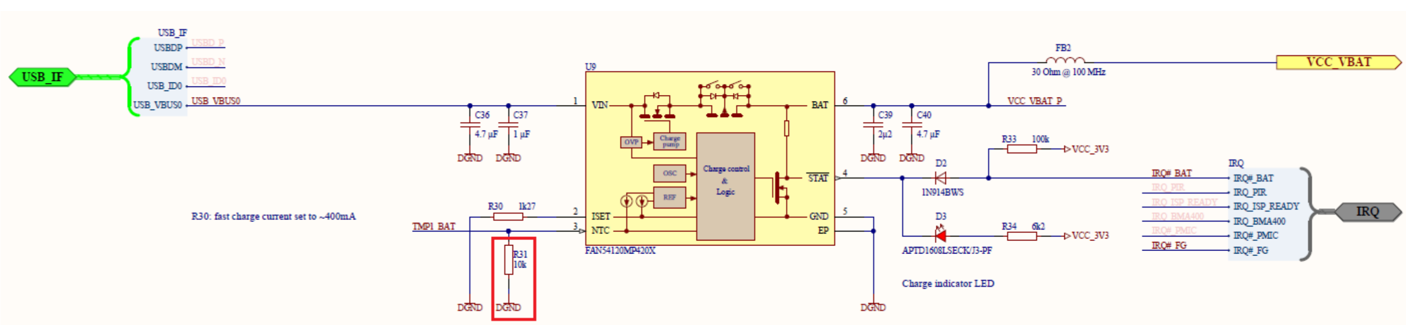


Fig.8 R31=10k assembled by default in order to emulate NTC temperature sensor, normally placed close to the battery

Connecting the re-chargeable Battery

For standalone operation, customers are able to adopt the board for Li / Li-Po battery connection. The high level specification of the battery should follow these basic parameters:

- BAT type: Li or Li-Po
- BAT voltage = 3.7V
- BAT floating voltage = 4.2V
- Capacity = based on the use case (recommended 1700mAh)

Charging current of the FAN54120 is fixed on the board to 400mA (fast charge). The following description and tests relate to Li-Po battery type LP435656: 3.7V 1700mAh fitting into the PCB design dimensions.
In order to mount the battery on the bottom part of the PCB, ON Semiconductor recommends to utilize also battery protection circuit (normally mounted as close as possible to battery). It's based on the LC05111C13MTTTG. The whole design package is available at ON Semiconductor's webpage and not part of the delivery. Once the battery is connected, customers can develop their application code with fuel gauge IC LC709204FXE-01TBG, assembled on the SECO-RSL10-CAM-GEVB board.
The further steps should be applied to properly connect the re-chargeable battery and its protection to the circuit:

1. Remove R31: the 10k resistor emulates the external NTC sensor. As the board isn't delivered with battery, this dummy resistive load must be connected towards FAN54120 (Fig.9).

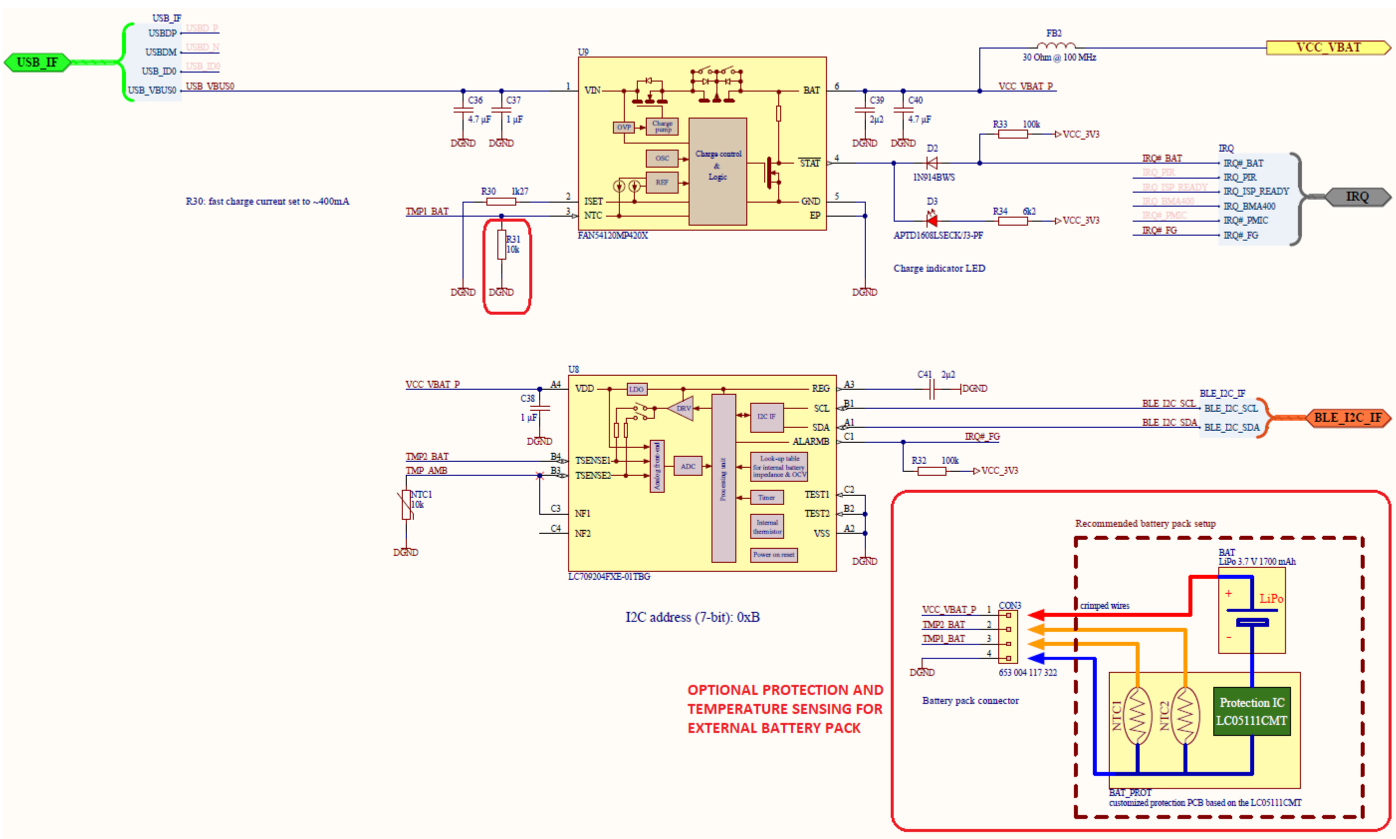


Fig.9 R31=10k to be removed once external Li battery and it's protection circuit connected

2. The protection circuit consists of two NTC temperature sensors that monitor battery temperature. NTC1 connects via TMP1_BAT header towards battery charger FAN54120, NTC2 applies for fuel gauge LC709204. The connection of battery pack is in the system schematic (Fig. 10). To safely operate SECO-RSL10-CAM-GEVB with external battery, recommended protection circuit shows Fig. 11 and physical implementation Fig. 12. Protection PCB is not part of the delivery and not the orderable item from ON Semiconductor. However, the complete manufacturing data, schematic, BOM is available under ON Semiconductor's web.

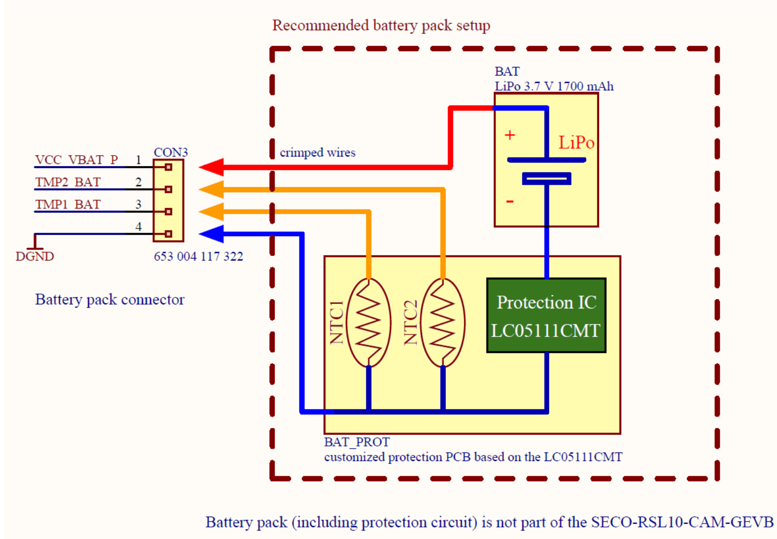


Fig.10 High level principal schematic of re-chargable battery connection and its protection circuit towards CON3

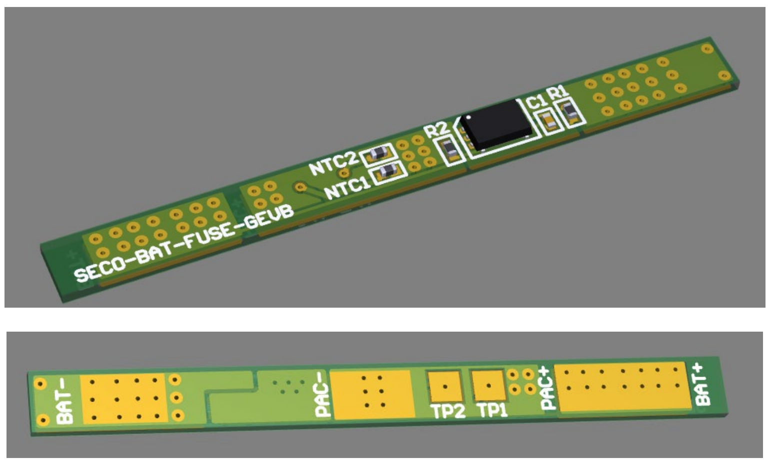


Fig.11 TOP and BOTTOM visualization of the protection circuit

Fig.12 Physical implementation of the battery and its protection circuit from bottom side of SECO-RSL10-CAM-GEVB

ON Semiconductor RSL10 Smartshot Board Support Software Package

ON Semiconductor delivers the RSL10 BLE SoC source code and complete software development kit attached to the SECO-RSL10-CAM-GEVB platform. The SDK contains also complete documentation and provides the guidelines on how the sensors data and picture transfer services are defined and executed inside RSL10.

The SDK is packaged in CMSIS format and named *ONSemiconductor.RSL10-SmartShot_BSP.1.0.1+173* or higher version. In order to allow customers to modify the source code and explore the SDK package, the following chapter guides on installation and capabilities of that package.

To easily acsses the core messaging structure of BLE channel for sensors and images streaming, two documents has been created with detailed high level description. Please visit ON Semiconductor webpage to accsses them quickly:

Sensors BLE messaging document: **External Trigger Sensor Services V1.0.0**

Picture transfer BLE messaging document: **Picture Transfer Service V1.0.1**

Installation Prerequisites

1. Install 64-bit version of Java from https://www.java.com/en/download/
2. Install J-Link Version 6.32i or later from https://www.segger.com/downloads/jlink (select J-Link software and documentation pack)
3. Download and install “ON Semiconductor IDE Installer” from https://www.onsemi.com/PowerSolutions/product.do?id=RSL10
4. Download the ‘’*RSL10 SDK Getting Started Guide*’’ and RSL10 CMSIS pack (baseline SDK) under ‘’*RSL10 Software Package*’’ from the above site. All of these are highlighted in the picture below. Save this CMSIS pack in a folder, for example, C:\cmsis_packs

5. Download and install the CMSIS software development kit *ONSemiconductor.RSL10-SmartShot_BSP.1.0.1+173* or higher to discover and modify the RSL10 SoC source code with complete documentation attached in it.
6. CMSIS pack at item 5. is dependent on ARM CMSIS pack as well. Please install *ARM CMSIS pack 5.7.0* or higher after download from: https://github.com/ARM-software/CMSIS_5/releases
7. CMSIS pack at item 5. is also dependent on ARM CMSIS – FreeRTOS version 10.3.1 or higher for users exposed to design the code under FreeRTOS with RSL10: https://github.com/ARM-software/CMSIS-FreeRTOS/releases

Importing the CMSIS-Packs

Once all packs are successfully imported, they can be viewed in the CMSIS pack manager perspective as shown below (Figure 13).

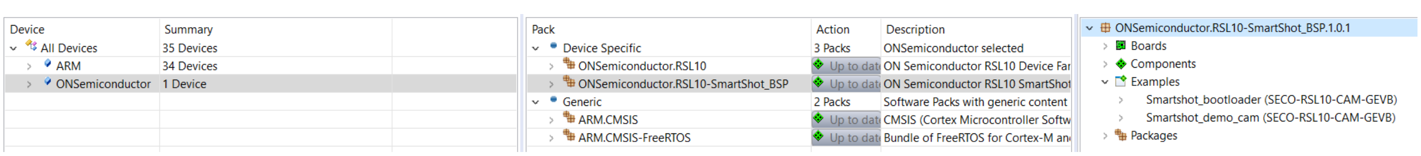


Figure 13. Imported CMSIS packages from Prerequisites including ONSemiconductor.RSL10-Smartshot_BSP (Board Support Package)

After installation of CMSIS SDK *ONSemiconductor.RSL10-SmartShot_BSP.1.0.1+173* or higher, IDE returns it visible as *ONSemiconductor.RSL10-Smartshot_BSP*.

It consists of two sample codes that are bind to SECO-RSL10-CAM-GEVB platform. To have the source code and all related documentation visible, right click on the selected sample code (Fig. 14) imports the project into Project Explorer space.

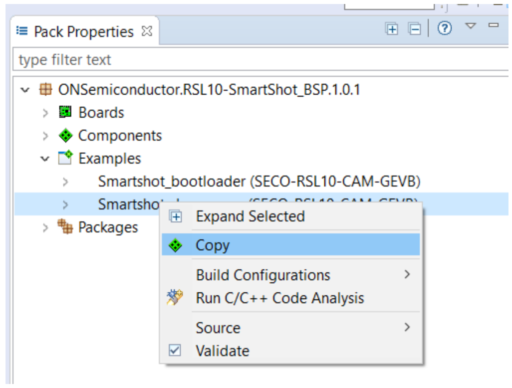


Figure 14. Right click on the sample code easily accsses the source code and complete documentation

Once the above action is executed, user has acsses to source codes for RSL10 SoC attached this platform. It's split in two sample codes:

1. *SmartShot application software*: it provides the source code and documentation for actual Smartshot application running on RSL10 (Fig.15)

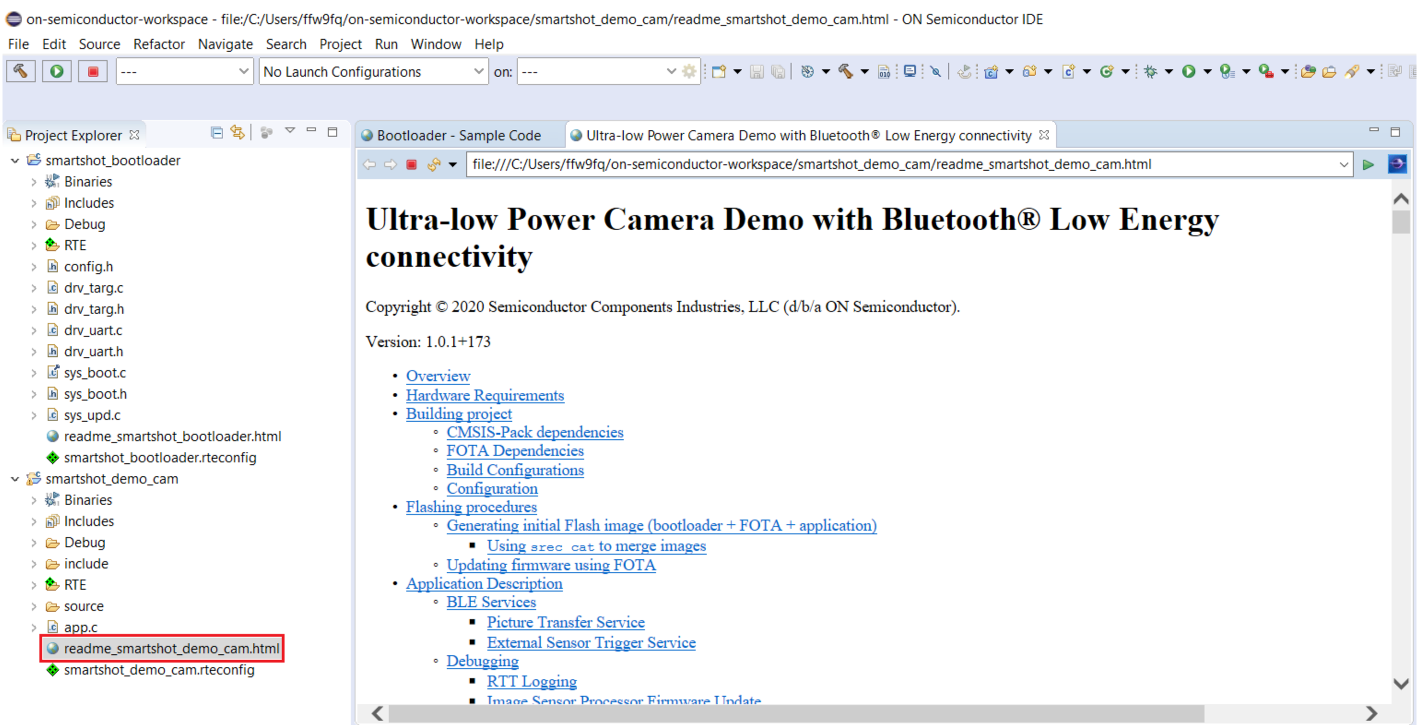


Figure 15. SmartShot source code and documentation inside CMSIS

2. *SmartShot bootloader sample code*: The SECO-RSL10-CAM-GEVB platform features FOTA (Firmware Over The Air) updates capability for RSL10 BLE SoC. The Firmware over the Air (FOTA) allows wireless firmware update.

Two methods are available for performing of FOTA updates on FOTA enabled devices:

- RSL10 FOTA Mobile Application ([Android](), [iOS]())
- FOTA.Console PC Tool with RSL10 USB Dongle

Both methods are described in *RSL10 Firmware Over-The-Air User's Guide* from [RSL10 Documentation Package] in section 4.4 and section 9.

The SECO-RSL10-CAM-GEVB board can be switched into FOTA mode by pressing and holding the on-board push button PB1 during normal operation. Switch to FOTA mode is indicated by 1 second long flash of LED.

The FOTA images are bundled in *ONSemiconductor.RSL10-SmartShot_BSP.1.0.1+173* or higher SDK CMSIS package. Figures 16 and 17 shows the sample code and documentation attached to that part.

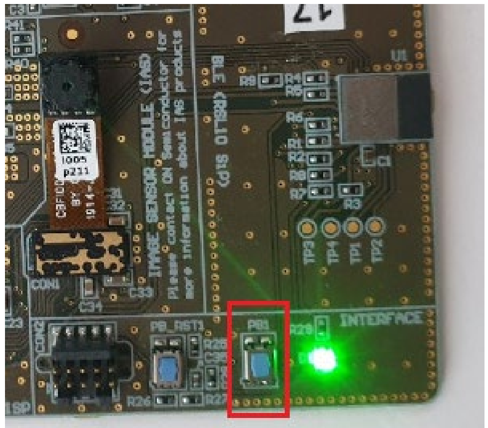


Figure 16. Switch to FOTA mode by hilding of PB1 push button

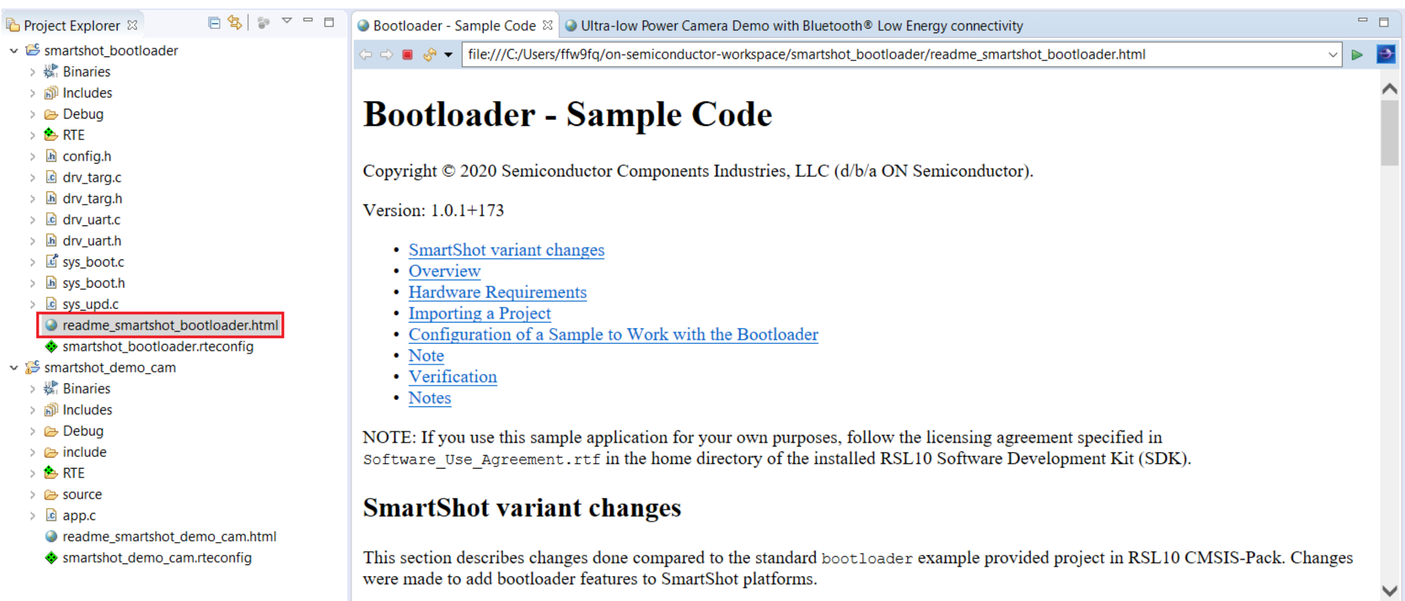


Figure 17. Bootloader sample code and documentation package

Mobile applications support

SECO-RSL10-CAM-GEVB platform operates with both Android and iOS based systems. Customers can easily download the app from stores. Please look for the branding name *RSL10 Smartshot* on the respective stores (Fig.18).

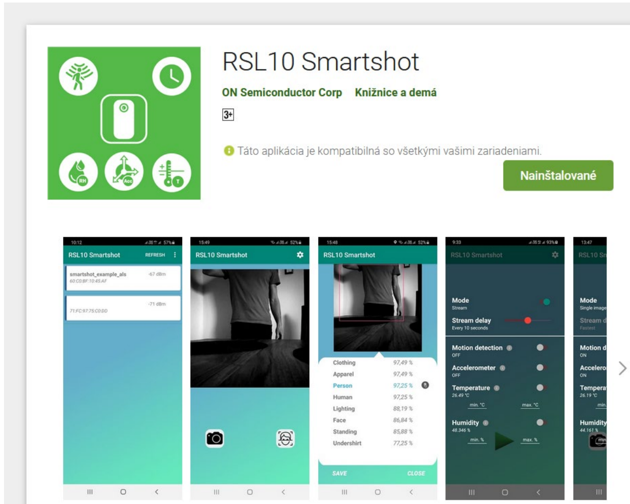


Figure 18. Mobile apps for the SECO-RSL10-CAM-GEVB can be found under RSL10 Smartshot branding name

Abstract

This guide provides basic instructions for installing and working with RSL10Smartshot Android mobile application which is Bluetooth-connected to the RSL10Smartshot board.

1 Introduction

The RSL10Smartshot mobile application (app) work with RSL10 Smartshot board SECO-RSL10-CAM-GEVB (board), able to control and set board and receive data (images) and transform it to the visual form through the app.

Current version of app let take a single image and enables recognition by the AWS Rekognition service, run stream of images and use the board like "alarm system" by using sensors placed on the board.

By setting some of the triggers sensors (PIR sensor, accelerometer, temperature and humidity measure), the board will take an image at a particular moment when some of the sensors detect change in state or value.

2 Installation

The RSL10Smartshot app is available on Google Play here. Installation is simple and similar to other common mobile applications.

After successful installation, we can run app. If user runs the application for the first time, all permissions must be enabled and user to manually turn on the GPS and BlueTooth functionality.

Bluetooth Low Energy (BLE) search process requires the GPS, so the GPS must be turned on when we want to discover board and communicate with it.

3 Work with RSL10Smartshot and functions

In this part are listed and described all functionalities of RSL10Smartshot set-up.

3.1 RSL10Smartshot board BLE search

RSL10 Smartshot app immediately starts to discover near Bluetooth devices. We find Bluetooth device with name "smartshot-demo-cam" or similar. (Figure 19)

The app can only connect and work with RSL10Smartshot board.

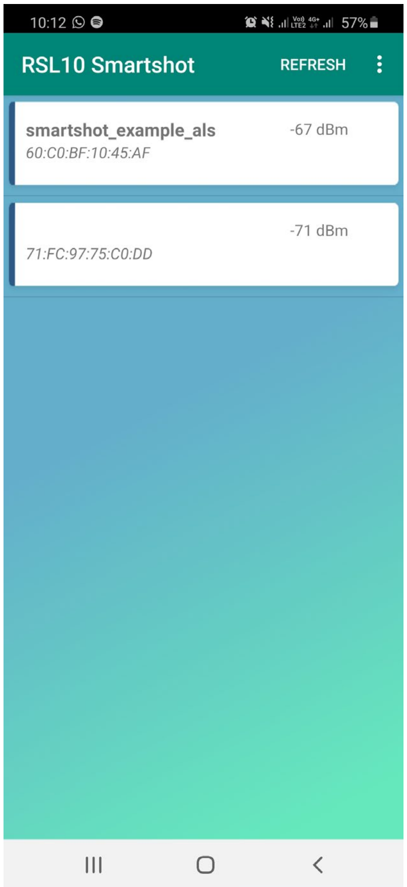


Fig.19 Discovery of the Smartshot board

If RSL10Smartshot device doesn't appear, tap to REFRESH button and search will be restarted.

3.2 Taking a single image

Camera and recognition icons appear after successful connection with board and everything is ready to work with RSL10Smartshot.

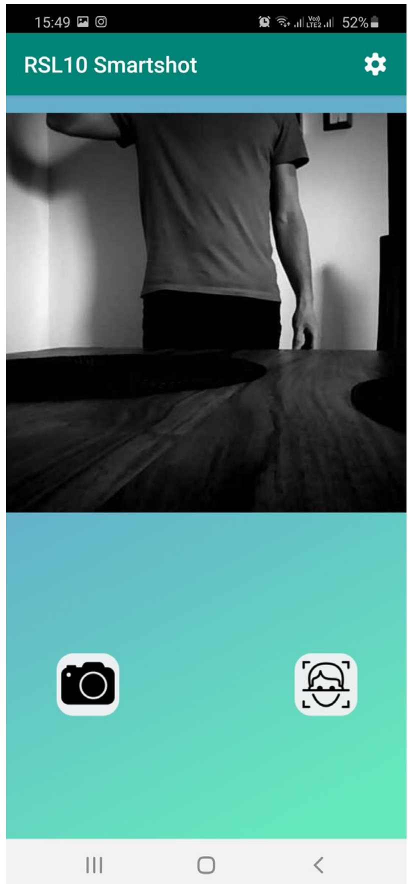


Fig.20 taking the picture

The most basic function is to capture a single image, which we do by taping on the camera icon (left). Subsequently, progress bar will be displayed to represent progress of image receiving.

After receiving, the image is displayed on the screen. Next step may be to recognize this image by AWS Rekognition service.

3.3 AWS Rekognition

You can provide your captured image to AWS Rekognition Service, which will analyzes image a returns the labels of objects that were recognized on image.

To use this function is needed to create own AWS account and have your smartphone connected to the internet.

To connect your AWS Account with RSL10 Smartshot app, user has to enter *accessKey* and *secretKey* (Fig. 21). Screen with two rows appears after click on the recognition icon, or you can find it in option menu on first (BLE discovery) screen.

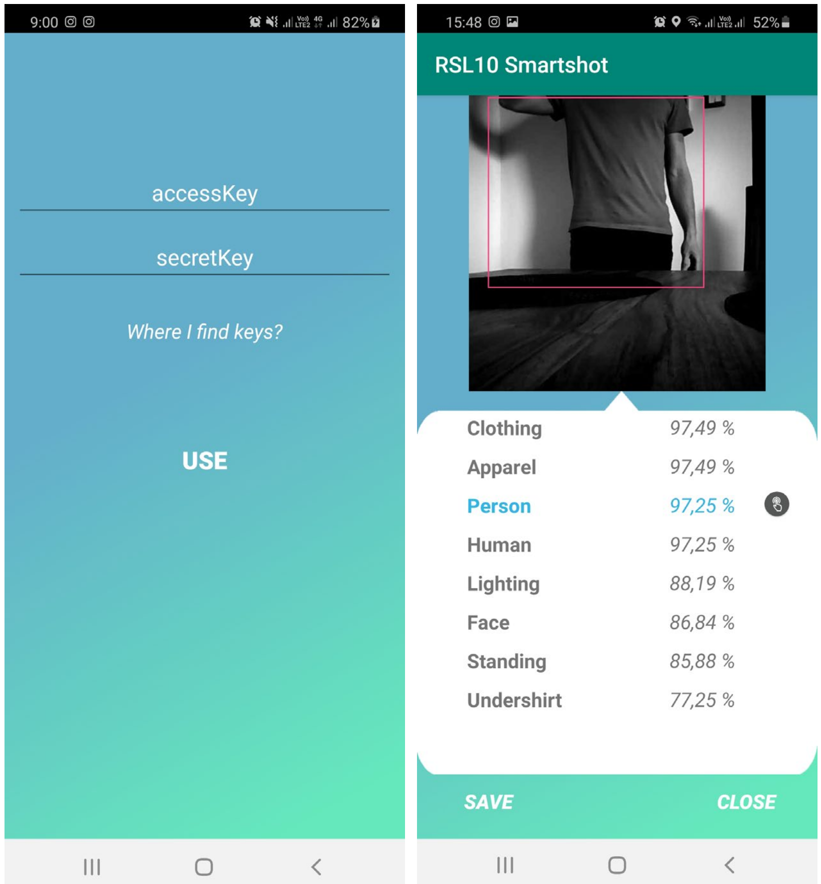


Fig.21 Amazon Rekognition service in action. Once the picture is taken, AWS Rekognition returns the analyzed picture

After analysis of your captured image, a list of detected objects is displayed. Blue label allows to display bounding box for particular object on image (Fig. 21).

Accuracy of compliance is represented by percentage number next of every label.

The image can be saved for later analysis or downloaded to your PC from smartphone's storage. You can find the saved images in option menu on first (introductory) screen (Fig.22).

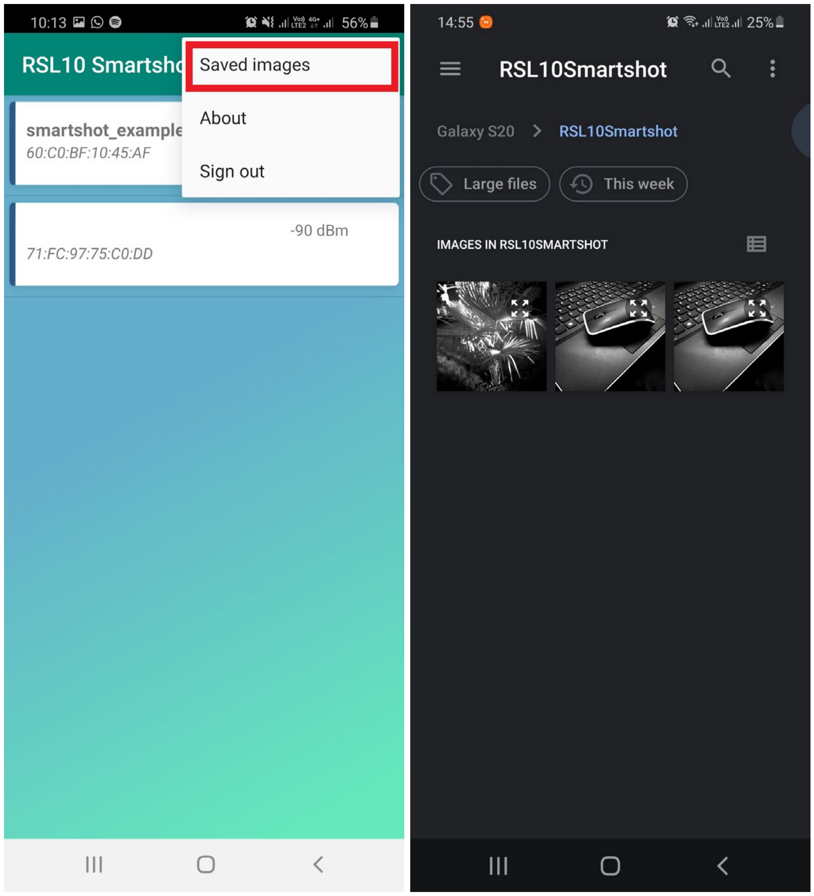


Fig.22 Saving the taken images embedded in the application

The RSL10Smartshot app allows recognize only images captured by RSL10Smartshot board

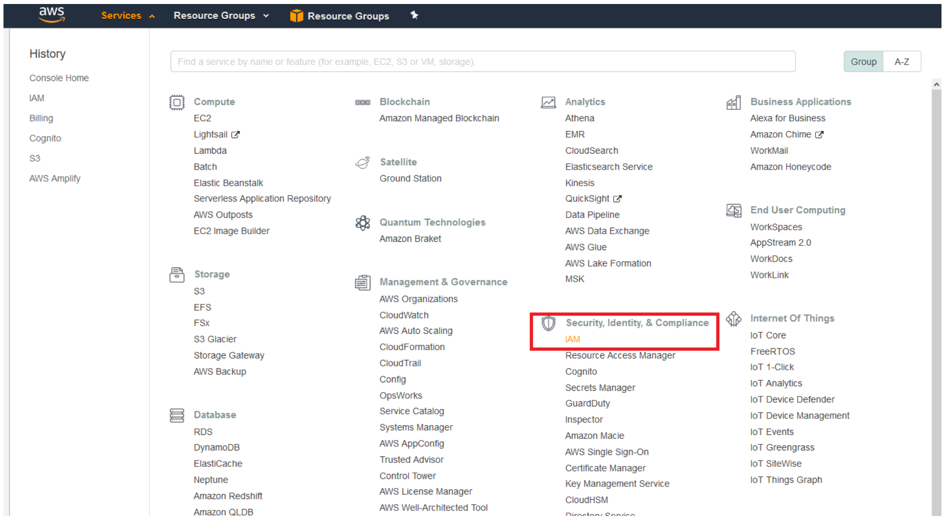
3.3.1 Create AWS account

1. Visit AWS website here.
2. Click on "Create an AWS Account" in upper right corner
3. Fill out all required fields
4. You will receive email in short time where confirm your email address

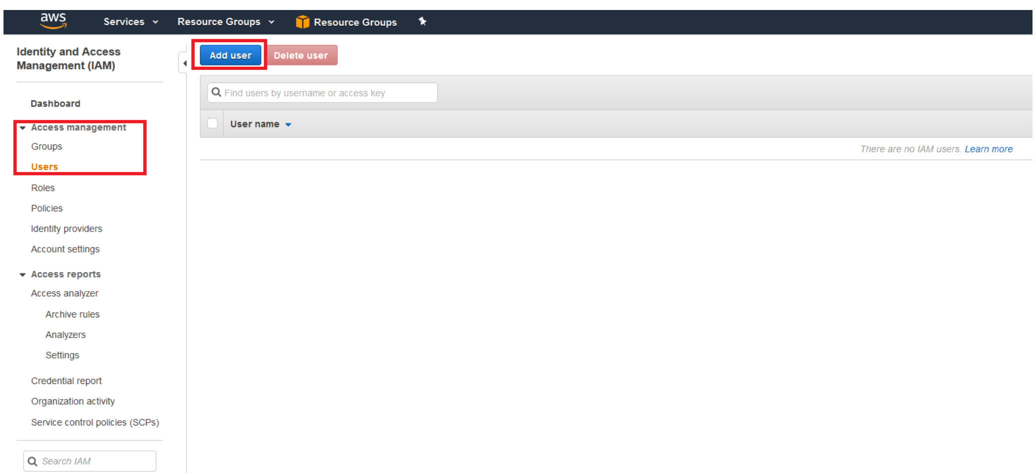
3.3.2 Set AWS Rekognition permission

For using Rekognition service is needed to attach permissions for this service in you AWS account

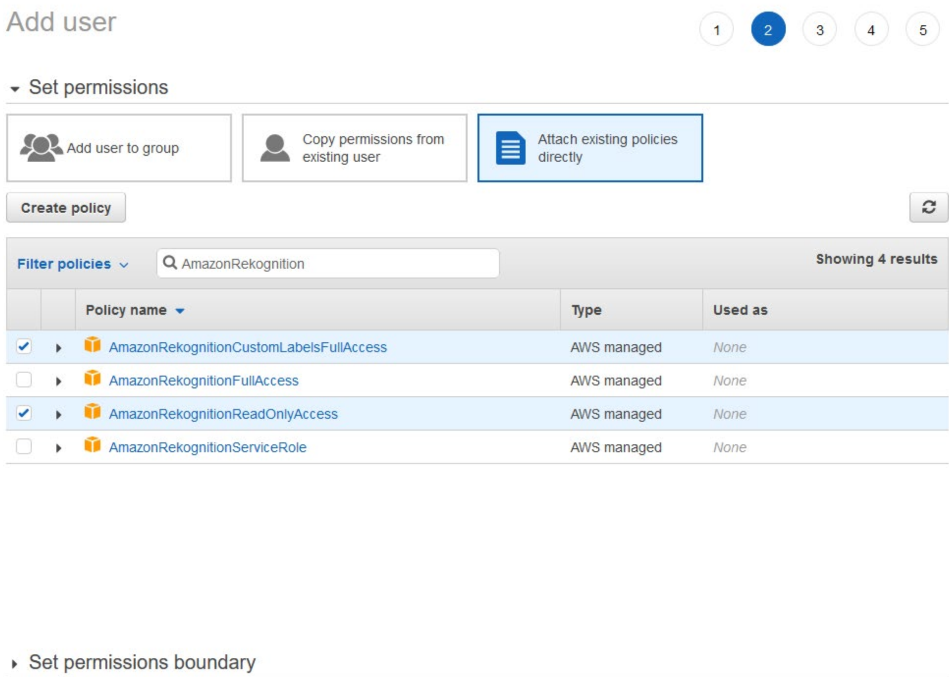
1. Log-in to your AWS account
2. Choose "IAM" service in "Security, Identity, &Compliance" section.



3. In left option menu choose "Access management" → "Users" and add new user(Programmatic access → Next → Attach existing policies directly)

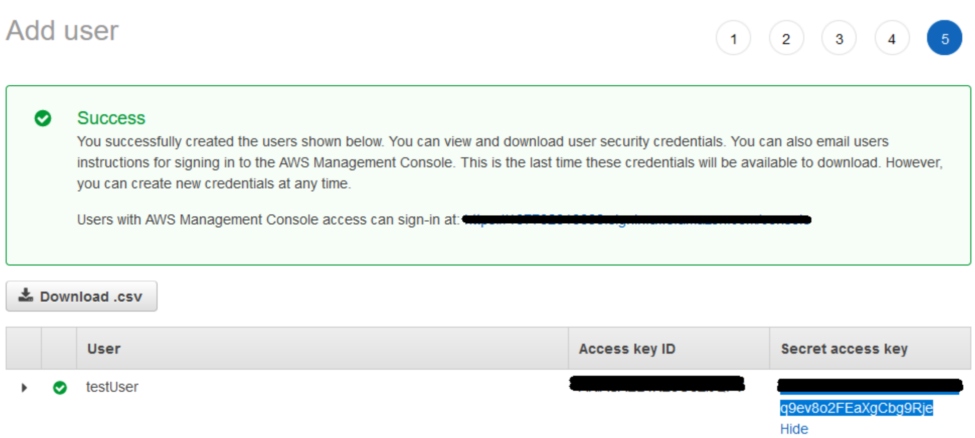


4. Find "AmazonRekognitionReadOnlyAccess" and "AmazonRekognitionCustomLabelsFullAccess", check the boxes and click on "Next: Review"



5. Skip tags page and in review click on "Create user"

6. Last page shows the generated accessKey and secretKey. Copy SecretKey now and save it on safe place for later used, because you won't be able to see it in future



7. Now users have accessKey and secretKey, so one can utilize them in the app.

3.4 Stream

Besides taking a single image you can run a stream of images with different frame rate.

By tap on icon at upper right corner you'll open the option menu, where you can switch from "Single image" mode to "Stream" mode and set frame rate of stream (Fig. 23).

Stream frame rate values listed under slider are different for each BLE version. Transmission time may be influenced by size of captured image and version of BLE. Duration of sending one image in stream mode and available frame rates dependent on BLE version are listed in table below (Table 1) An average size image (15kB) was used.

Table 1: Image stream time interval depends on the BLE version embedded in the phone

BLE version	Sending a single image	Available stream frames (s)
4.0	~ 3.7 s	10, 15, 30, 60
5.0	~ 0.7 s	3, 10, 30, 60

After setting of the stream, you can hide an option menu and start the stream by play button.

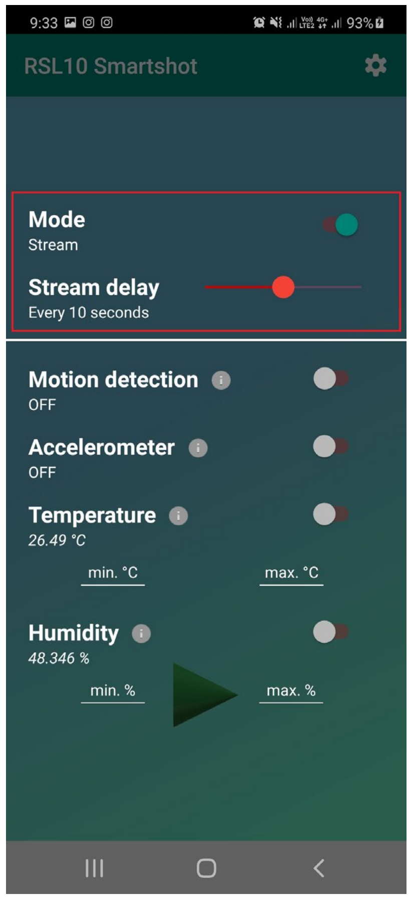


Fig. 23 Image streaming and frame rate settings

3.5 Sensor Triggers

You can leave image capture only on the RSL10Smartshot board.

The RSL10Smartshot allows the use of 4 sensors to set triggers, which will take a picture when change in value is detected. These functionalities can be found after tap on gear wheel icon at upper right corner placed on main screen (same as stream settings). User is capable to set one, multiply (depending on the user's preference) or expose all sensors at once to trigger the image capture upon the threshold limits defined by user.

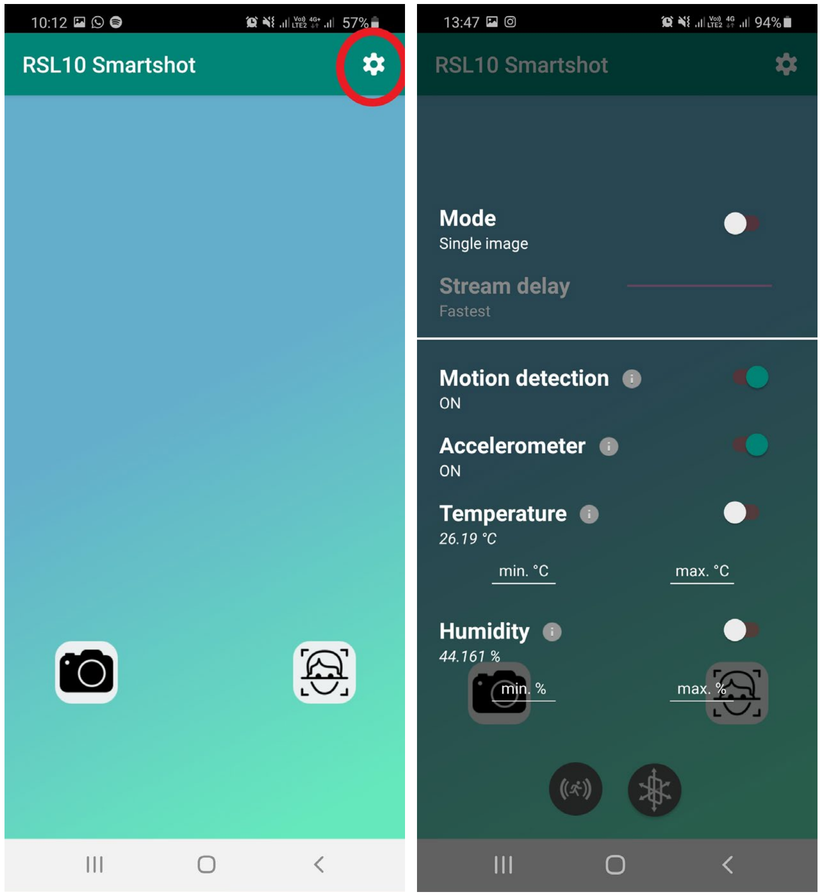


Fig. 24 Image streaming and sensors settings

The PIR sensor and accelerometer take a picture when the movement is detected, respectively acceleration. To set triggers for temperature and humidity you have to enter a lower and upper limits for both values. If one of these limits are crossed, RSL10Smartshot board take an image and notice for particular sensor will be displayed (Fig. 25-28).

Using sensors triggers is possible only in "Single image" mode. The following sections describe the settings of each trigger. You can also find tips in the option menu by tap on information icons.

3.5.1 Motion detection

By switching on "Motion detection" and hiding option menu, board starts to detect of motion by PIR sensor placed on RSL10Smartshot board. Board takes a picture and send captured data (image) to the app.

Fig. 25 Motion Detection Trigger

The app notices user about received image by blinking motion icon. Minimal time between two detection is 5 seconds.

3.5.2 Acceleration detection

By switching on "Accelerometer" and hiding the option menu, board starts to detect change of acceleration. Board takes a picture and send captured data (image) to the app (Fig. 26).

Fig. 26 Accelerometer detection trigger

The app notices user about received image by blinking accelerometer icon. Minimal time between two detection is 5 seconds.

3.5.3 Temperature detection

Function of temperature trigger needs two limits or boundaries, lower and upper, which define monitored interval. The current temperature value is displayed below the temperature label. Enter temperature limits with a maximum two decimal places.

After enter minimal and maximal values, switch on the button and hiding option menu, temperature trigger will become active (Fig. 27).

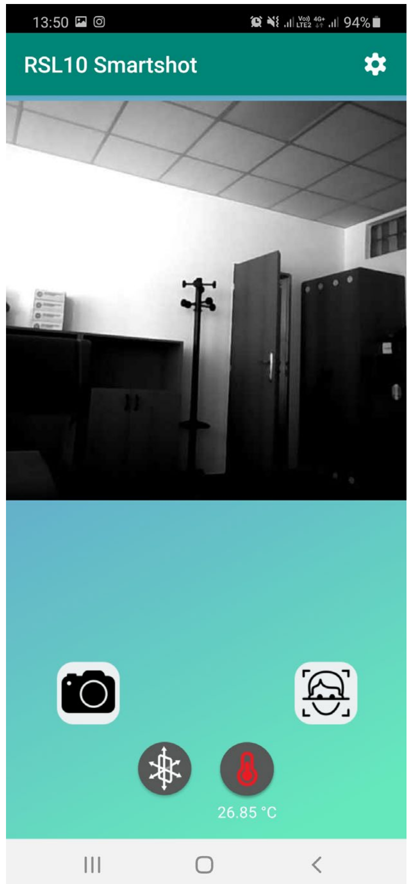


Fig. 27 Temperature thresholds detection trigger

If temperature crosses lower limit, RSL10Smartshot takes an image and displays temperature icon in blue color (blue color = lower limit crossed). Otherwise, temperature icon in red color will be used to indicate that upper limit has been exceeded (red color = upper limit crossed).

Minimal time between two detection is 5 seconds.

In cases, when value crosses the limit closely, the RSL10Smartshot app may not notice crossing the same limit backward. For example, the upper limit is sets on 25°C. Temperature will cross the limit by value 25,1°C. RSL10Smartshot is taking a picture and there is 5s gap between two detection as well. Meanwhile temperature crosses the upper limit backward by value 24,95°C. This crossing of the limit RSL10Smartshot won't notice. It's caused by time between two detection and taking a picture.

In the opposite case, when temperature is increasing/decreasing rapidly, may be a large difference between the limit and the value that has exceeded the limit. For example, the limit is set to 25°C and the detected value is 35°C. The value 35°C is first value which crossed the limit.

3.5.4 Humidity detection

Function of humidity trigger needs two limits or boundaries, lower and upper, which define monitored interval. The current humidity value is displayed below the humidity label. Enter humidity limits with a maximum three decimal places.

After enter minimal and maximal values, switch on the button and hiding the option menu, humidity trigger will become active. Humidity trigger can be set from 0 to 100%.

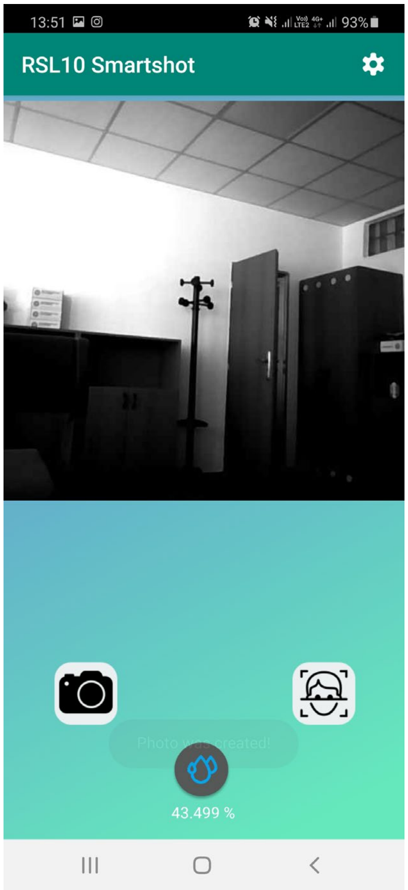


Fig. 28 Humidity detection trigger

If humidity crosses lower limit, RSL10Smartshot takes a image and displays humidity icon in blue color (blue color = lower limit crossed). Otherwise, humidity icon in red color will be used to indicate that upper limit has been exceed (red color = upper limit crossed).

Minimal time between two detections is 5 seconds.

In cases, when value crosses the limit closely, the RSL10Smartshot app may not notice crossing the same limit backward. For example, the upper limit is sets to 40%. Humidity will cross the limit by value 40.08%. RSL10Smartshot is taking a picture and there is 5s gap between two detection as well. Meanwhile humidity crosses the upper limit backward by value 39.97%. This crossing of the limit RSL10Smartshot won't notice. It's caused by time between two detection and taking a picture.

In the opposite case, when humidity is increasing/decreasing rapidly, may be a large difference between the limit and the value that has exceeded the limit. For example, the limit is set to 40% and the detected value is 65.4%. The value 65.4% is first value which crossed the limit.