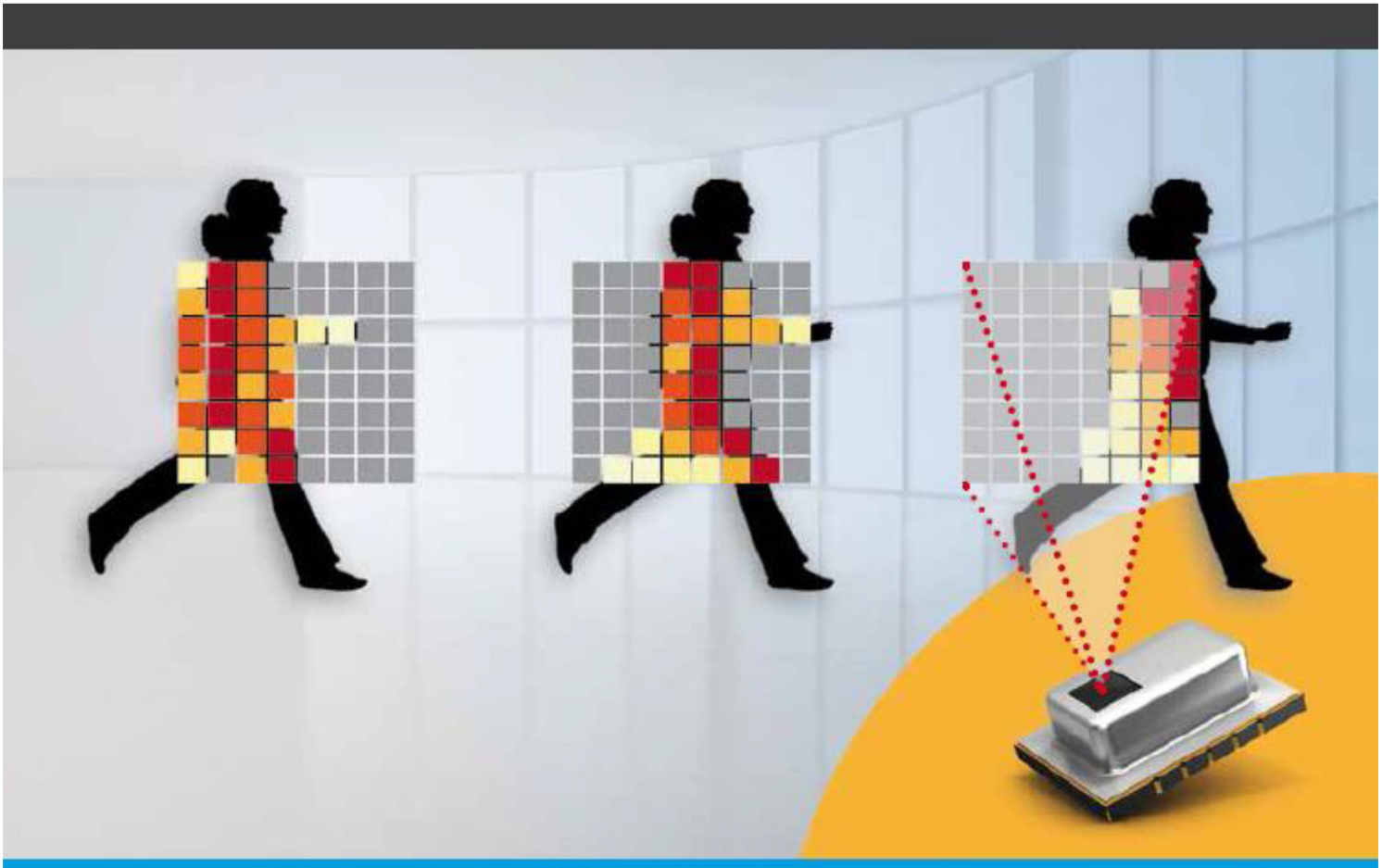
Panasonic

# User Manual

## Grid-EYE Evaluation Kit



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# Content

1 Terms & Abbreviations ..... 3

2 Introduction ..... 4

2.1 Product Introduction ..... 4

2.2 Evaluation Kit Component Details ..... 5

2.2.1 Grid-EYE Sensor ..... 6

2.2.2 ATSAMD21- SMART ARM-Based Microcontroller ..... 7

2.2.3 Bluetooth Module PAN1740 ..... 8

3 Interface Definition ..... 9

3.1 Download & Debug ..... 9

3.1.1 USB interface pin definition (J16) ..... 9

3.1.2 Serial Wire Debug interface Header definition (J17) ..... 10

3.1.3 Serial Wire Debug port for PAN1740 Header definition (J1) ..... 10

3.1.4 Arduino Interfaces (J2, J3, J4 and J5) ..... 11

3.1.5 Arduino Analog I/O A0-A5 pin definitions (J2) ..... 12

3.1.6 Arduino Digital I/O D0-D7 pin definition (J3) ..... 12

3.1.7 Arduino Power port pin definition (J4) ..... 13

3.1.8 Arduino Digital I/O D8-D15 pin definition (J5) ..... 13

3.1.9 Other Jumpers Definition ..... 14

4 Development with Evaluation Kit ..... 15

4.1 Firmware architecture ..... 15

4.1.1 Independent Mode ..... 15

4.1.2 Arduino Mode ..... 17

4.2 Firmware development ..... 19

4.2.1 Development Tools ..... 19

4.2.2 Development on ATSAMD21 ..... 20

4.2.3 Development with Grid-EYE APIs ..... 21

4.2.4 Development on Arduino ..... 22
4.2.5 Development on PAN1740 ..... 25
4.3 Updating firmware ..... 28
4.3.1 Use USB interface to update ATSAMD21G18A ..... 28
4.3.2 Use Serial interface to update PAN1740 ..... 30
5 Grid-EYE Demonstration Software for PC ..... 35
5.1 Preparation ..... 35
5.1.1 Jumper Setting ..... 35
5.2 Demonstration ..... 36
5.2.1 Independent Mode Demonstration ..... 36
5.2.2 Arduino Mode Demonstration ..... 40
6 Appendix ..... 43
6.1 Install USB Driver for ATSAMD21G18A ..... 43
7 ESD precautions and proper handling procedures ..... 46
8 Compliance Information ..... 47

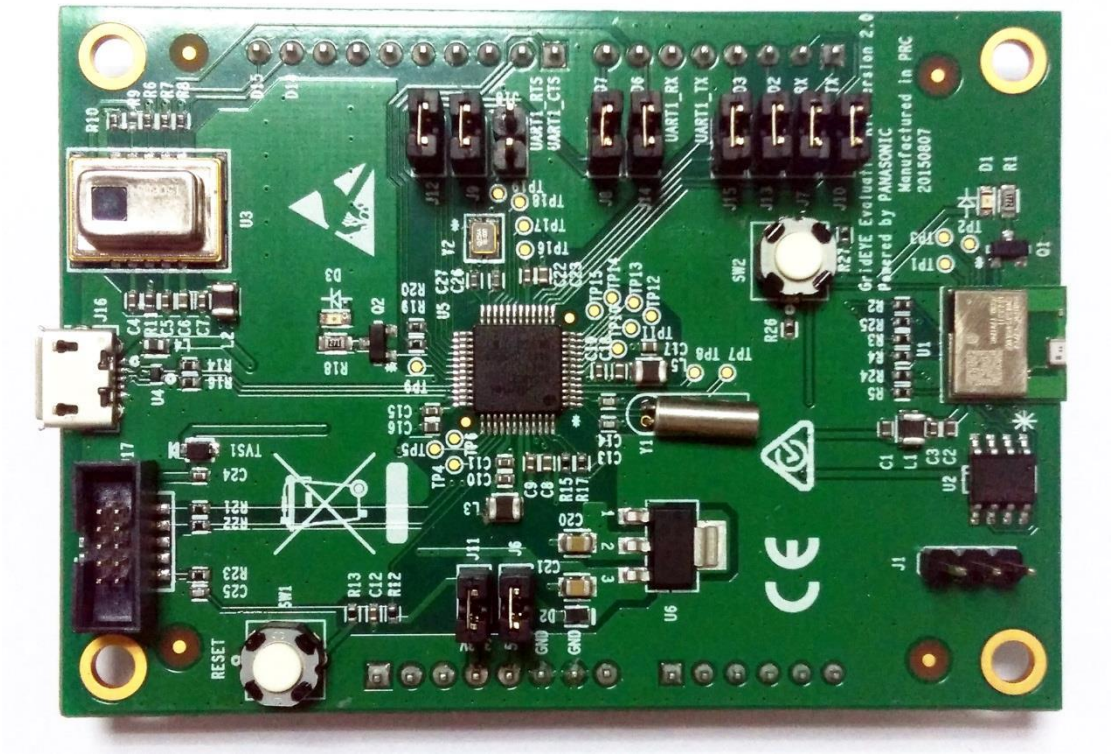
# 1 Terms & Abbreviations

The following terms & abbreviations will be referenced in this document:

| Term / Abbreviation | Definition |
|---|---|
| BT | Bluetooth ( refers to PAN1740) |
| CDC | Communications Device Class |
| HW | Hardware |
| I2C / IIC / $I^2C$ | Inter-Integrated-Circuit |
| I/O | Input / Output |
| IoT | Internet of Things |
| IR | Infrared |
| JTAG | Joint Test Action Group |
| MCU | Microcontroller |
| PC | Personal Computer |
| SW | Software |
| SWD | Serial Wire Debug |
| UART | Universal Asynchronous Receive Transmit |
| USB | Universal Serial Bus |

# 2 Introduction

This user manual is aimed at giving the customers an overview of the latest evaluation kit for Grid-EYE sensor released by Panasonic. The following picture shows how your evaluation kit should look like when you take it out of the box.



## 2.1 Product Introduction

Grid-EYE Infrared (IR) Array sensor Evaluation Kit combines the Panasonic's state of the art Grid-EYE sensor, Panasonic "nanopower" PAN1740 Bluetooth Smart module and a microcontroller on one PCB. By combining its new IR sensor technology with Bluetooth technology and software for IR detection of people and objects on one board, Panasonic enables customers to develop rapid prototypes and quickly build their own wireless sensor "Internet of Things" applications.

To make it simpler and easier for the user, Panasonic has been flexible in the development of this evaluation kit. The board functions in a standalone mode or it can be connected to an Arduino host board if the user wants to realize the functionality of the sensor with more than the provided interfaces. The two operating modes of the evaluation kit are explained below:

### 1) Independent mode

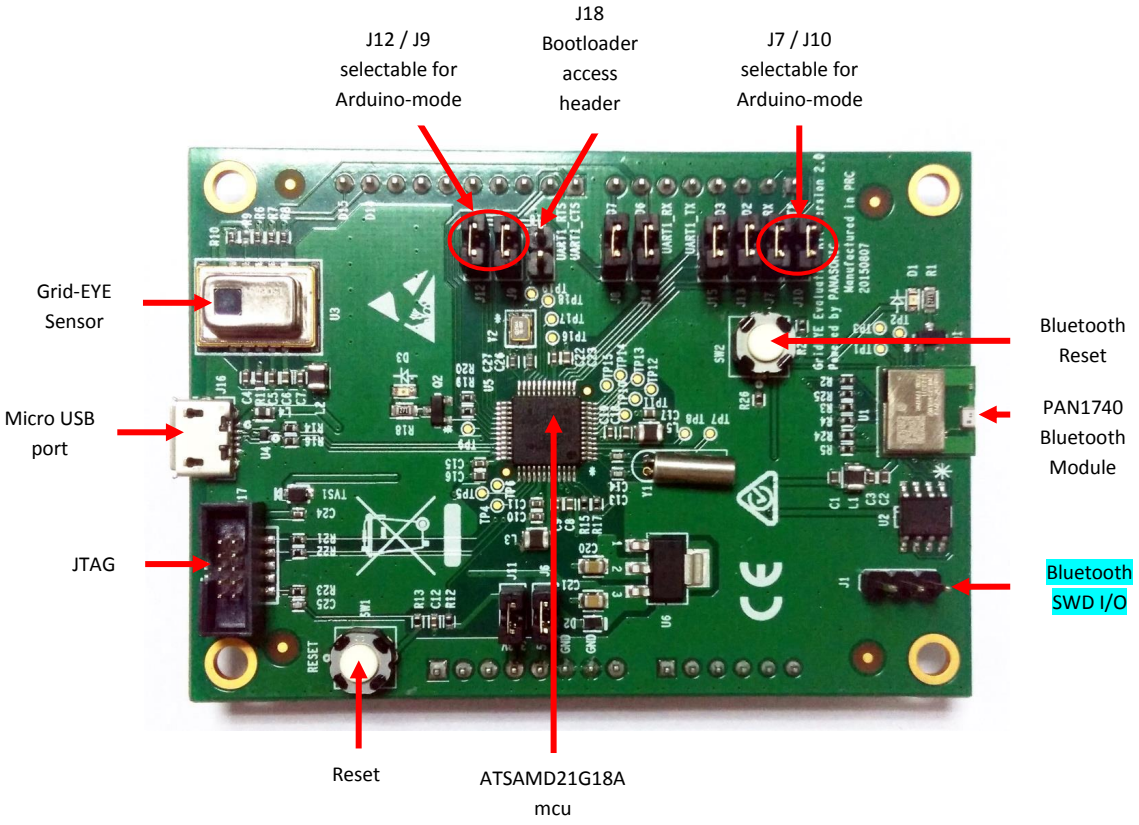
The onboard microcontroller ATSAMD21G18 receives the infrared image data sampled by Grid-EYE sensor through the $I^2C$ interface, and then sends this data to a PC and smartphone via USB and Bluetooth, respectively.

### 2) Arduino mode

Arduino mother board receives the data sampled by Grid-EYE sensor through the $I^2C$ interface and then sends the data to a PC and smartphone via USB and Bluetooth, respectively. In this mode the microcontroller, ATSAMD21G18, acts as USB CDC device and provides a communication channel between Arduino mother board and PC.

In both of the two modes, the Bluetooth module provides a communication channel between the microcontroller or the Arduino mother board, and smartphone.

## 2.2 Evaluation Kit Component Details



**WARNING**

- **The jumper shunt for the pin-header designated J18 must not be placed on the pin-header prior to using the board, unless the intent is to access the Bootloader.**
- **The Grid-EYE board has Arduino headers soldered on for convenience, should the user choose to host the board onto an Arduino (DUE) mother board. Users are reminded to be careful so not short-out the pins or have the board resting on a conductive surface.**

### 2.2.1 Grid-EYE Sensor

| Specification | Value |
|---|---|
| Power voltage | 3.3V ±10%, 5V ±10%/ |
| Current consumption | 4.5mA (normal), 0.8mA (standby), 0.2mA (sleep) |
| View angle | 60 degrees (x,y) |
| Absolute temperature accuracy | High gain: ±2.5°C (typ.)<br>Low gain: ±3.0ºC (typ.) |
| Noise Equivalent Temperature Difference | 0.5°C @ 10Hz |
| Frame rate (selectable): | 1 frame/sec or 10 frames/sec |
| External interface | $I^2C$ (12bit) |
| Operation mode | Normal, Standby, Sleep (Selectable) |
| Number of Pixel | 64 - (Vertical 8 × Horizontal 8 Matrix) |

Grid-EYE Sensor options:

Whilst the Evaluation Kit hosts and demonstrates capabilities of the 3.3V, Low Gain device, the user has the following options available for design-in and application:

- 3.3V high gain
- 3.3V low gain
- 5V high gain
- 5V low gain

| Item | Performance | |
|---|---|---|
| | High Gain | Low Gain |
| Applied Voltage | 3.3V +/- 0.3V or 5.0V =/- 0.5V | |
| Detection temperature range | +32°F to 176°F (0°C to +80°C) | -4°F to 212°F (-20°C to +100°C) |
| Temperature range of measured object | +32°F to 176°F (0°C to +80°C) | -4°F to 212°F (-20°C to +100°C) |
| Operating temperature range | +32°F to 176°F (0°C to +80°C) | -4°F to 176°F (-20°C to +80°C) |
| Storage temperature range | -4°F to 176°F (-20°C to +80°C) | -4°F to 176°F (-20°C to +80°C) |

Part Numbers:

| Product Name | Operating Voltage | Amplification factor | Part Number |
|---|---|---|---|
| Infrared array sensor Grid-EYE | 3.3V DC | High Gain | AMG8831 |
| | | Low Gain | AMG8832 |
| | 5.0V DC | High Gain | AMG8851 |
| | | Low Gain | AMG8852 |

The sensors are packaged in a 8mm x 11.6mm x 4.3mm SMD reflow mountable ‘can’ package. The packaging of the sensor is moisture proof, comparable to MSL level 3.

## 2.2.2 ATSAMD21- SMART ARM-Based Microcontroller

The Atmel® SMART™ SAM D21 is a series of low-power microcontrollers using the 32-bit ARM® Cortex®-M0+ processor, with identical peripheral modules, hex compatible code, identical linear address map and pin compatible paths between all devices in the product series. All devices include intelligent and flexible peripherals, Atmel Event System for inter-peripheral signaling, and support for capacitive touch button, slider and wheel user interfaces. The Grid-EYE sensor board hosts the ATSAMD21G18A variant in a 48-pin QFN package, ideal for a wide range of home automation, consumer, metering, and industrial

applications and supported by Atmel Studio, the Atmel Software Framework and SAMD21 Xplained kits. Basic specifications of the MCU are shown below:

| Item | Description |
|---|---|
| CPU Core | Cortex-M0+ |
| Max. CPU frequency | 48MHz |
| ROM | 256K |
| RAM | 32K |
| USB | Full-speed USB 2.0 (Support USB Host and USB device) |
| $I^2C$ | Up to 3.4MHz |
| UART | Up to 3.4MHz |
| Power Supply | 1.62V to 3.63V |

More details are available from:

http://www.atmel.com/Images/Atmel-42181-SAM-D21_Datasheet.pdf

### 2.2.3 Bluetooth Module PAN1740

The PAN1740 is a short-range BLE single mode module compliant with the Bluetooth V4.0 standard. It includes dedicated hardware for the Link Layer implementation of Bluetooth® Smart and interface controllers for enhanced connectivity capabilities. Due to its high performance, Panasonic chose to use this for the evaluation kit. Basic specifications of this BT module can be seen below.

| Item | Description |
|---|---|
| CPU Core | Cortex-M0 |
| CPU frequency | 16MHz or 32.768KHz |
| Power Consumption | Max power consumption: 4.9mA (TX and RX). |
| Bluetooth | Embedded BLE Stack and GATT Profile, qualified to the Bluetooth 4.0 standard |
| Operating Temperature | -40°C to 85°C |
| Gain | 93dBm |

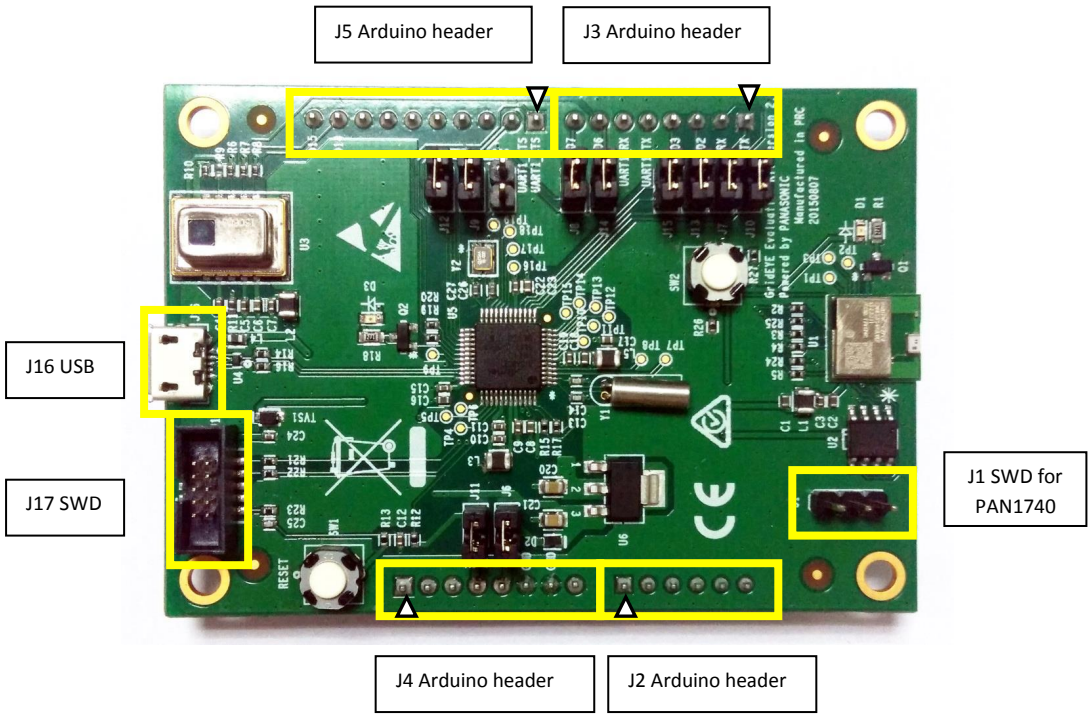
More details on this BT module can be found on the following link:
https://pideu.panasonic.de/products/wireless-modules/bluetooth/bluetooth-40-low-energy-single-mode/PAN1740-Bluetooth-Ultra-Low-Energy-Module.html

# 3 Interface Definition

This section of the manual will explain about the onboard USB interface, software debug interface, and pin definitions for J1 - J8.

## 3.1 Download & Debug

Below you can see the definition of different headers and interfaces on the evaluation kit.




### 3.1.1 USB interface pin definition (J16)

The Micro USB interface on the evaluation kit is used for power supply and communication with the external PC. The definition of USB pins is defined below in the table:

| Pin Number | Signal | Function |
|---|---|---|
| 1 | VBUS | +5V |
| 2 | DM | USB Data- |
| 3 | DP | USB Data+ |
| 4 | ID | USB ID |
| 5 | GND | GND |

### 3.1.2 Serial Wire Debug interface Header definition (J17)

Serial Wire Debug (SWD) is compatible with all ARM processors and any processor using JTAG for debugging. It provides a debug port for pin limited packages. It replaces the 5-pin JTAG port with a clock + single bi-directional data pin, SWDIO and SWCLK, providing all the normal JTAG debug and test functionality.

Standard 10-pin JTAG Debug & Download Interface are shown below in the table:

| Pin Number | Signal | Function |
|---|---|---|
| 1 | VDD3.3 | +3.3V |
| 2 | SWDIO | SW debug data signal for ATSAMD21 |
| 3 | GND | GND |
| 4 | SWCLK | SW debug clock signal for ATSAMD21 |
| 5 | GND | GND |
| 6 | NC | NC |
| 7 | GND | GND |
| 8 | NC | NC |
| 9 | GND | GND |
| 10 | RESET | Reset ATSAMD21 MCU |

GND = Ground

NC = Not Connected

### 3.1.3 Serial Wire Debug port for PAN1740 Header definition (J1)

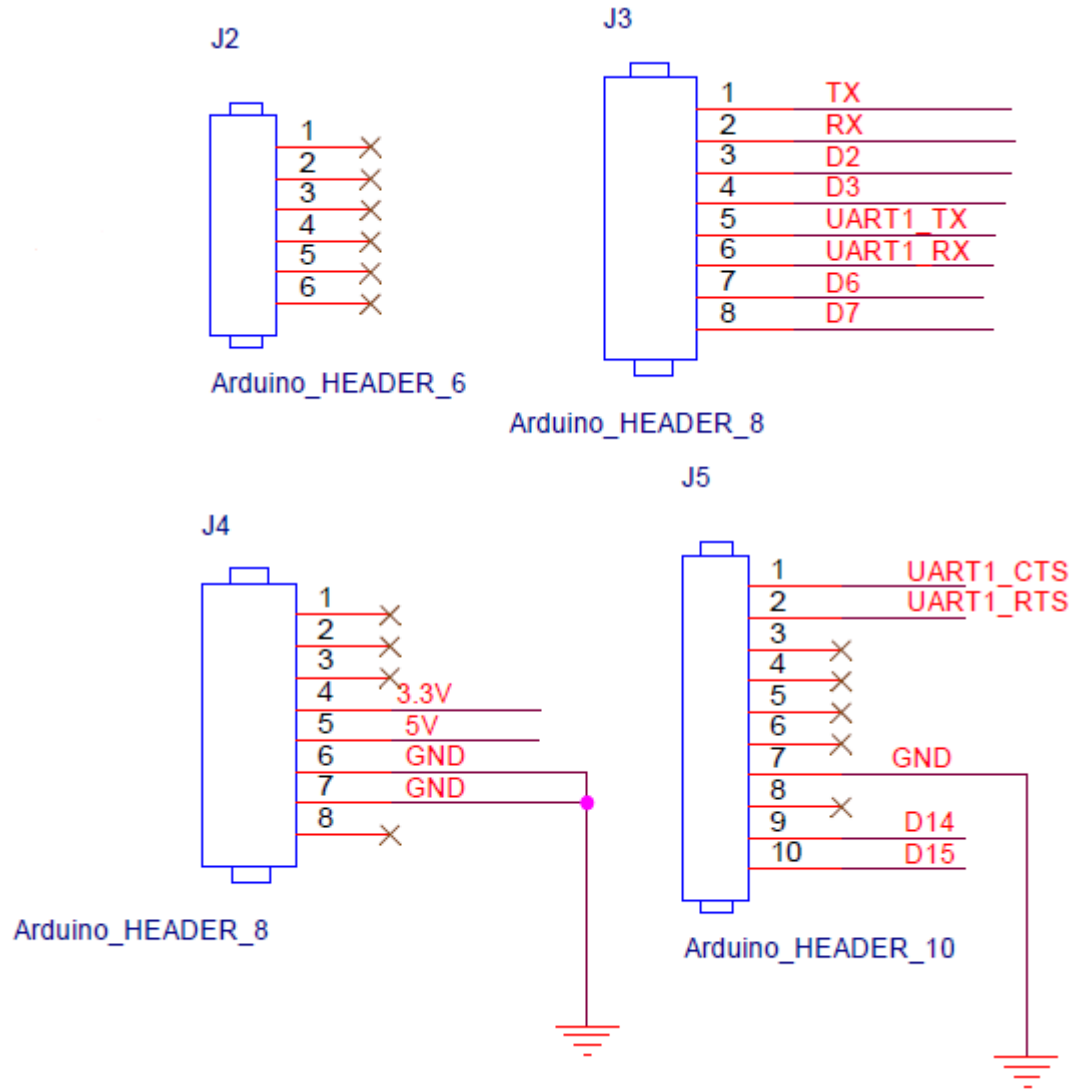
Standard 10-pin JTAG Debug & Download Interface are shown below in the table:

| Pin Number | Signal | Function |
|---|---|---|
| 1 | DIO | SW debug data signal for PAN1740 |
| 2 | P1_4/SWCLK | SW debug clock signal for PAN1740 |
| 3 | OTP | One time programming selecting pin for PAN1740 |

### 3.1.4 Arduino Interfaces (J2, J3, J4 and J5)

The following schematics define the pins for each header on the evaluation kit.

Schematics:



### 3.1.5 Arduino Analog I/O A0-A5 pin definitions (J2)

On the evaluation kit, analog I/O is not supported. The headers are meant for physical Arduino compatibility only. The table below shows the pin definitions for this header.

| Pin Number | Signal | Function |
|---|---|---|
| 1 | NC | NC |
| 2 | NC | NC |
| 3 | NC | NC |
| 4 | NC | NC |
| 5 | NC | NC |
| 6 | NC | NC |

### 3.1.6 Arduino Digital I/O D0-D7 pin definition (J3)

The following table shows the pin definition of the J3 header.

| Pin Number | Signal | Function |
|---|---|---|
| 1 | TX | D0 for Arduino / TX pin for PAN1740 UART |
| 2 | RX | D1 for Arduino / RX pin for PAN1740 UART |
| 3 | D2 | D2 for Arduino |
| 4 | D3 | D3 for Arduino |
| 5 | UART1_TX | D4 for Arduino / TX pin for ATSAMD21 UART1 |
| 6 | UART1_RX | D5 for Arduino / RX pin for ATSAMD21 UART1 |
| 7 | D6 | D6 for Arduino |
| 8 | D7 | D7 for Arduino |

### 3.1.7 Arduino Power port pin definition (J4)

The following table shows the pin definition of the J4 header.

| Pin Number | Signal | Function |
|---|---|---|
| 1 | NC | NC |
| 2 | NC | NC |
| 3 | NC | NC |
| 4 | 3.3V | 3.3V voltage input power |
| 5 | 5V | 5V voltage input power |
| 6 | GND | GND |
| 7 | GND | GND |
| 8 | NC | NC |

### 3.1.8 Arduino Digital I/O D8-D15 pin definition (J5)

The following table shows the pin definition of the J5 header.

| Pin Number | Signal | Function |
|---|---|---|
| 1 | UART1_CTS | D8 for Arduino |
| 2 | UART1_RTS | D9 for Arduino |
| 3 | NC | D10 for Arduino |
| 4 | NC | D11 for Arduino |
| 5 | NC | D12 for Arduino |
| 6 | NC | D13 for Arduino |
| 7 | GND | GND |
| 8 | NC | AREF for Arduino |
| 9 | D14 | D14 for Arduino / SDA pin for ATSAMD21 $I^2C$ |
| 10 | D15 | D15 for Arduino / SCL pin for ATSAMD21 $I^2C$ |

### 3.1.9 Other Jumpers Definition

The following table explains several other headers on the evaluation kit.

| Connecter | Pin 1 | Pin 2 | Function |
|---|---|---|---|
| J7 | TX | UART_RX | Select to connect RX pin for ATSAMD21 USART1 with D1 for Arduino and TX for PAN1740 UART. |
| J10 | RX | UART_TX | Select to connect RX pin for PAN1740 UART with TX pin for ATSAMD21 UART |
| J13 | D2 | UART_CTS | Select to connect D2 for Arduino with CTS pin(hardware flow control) for ATSAMD21 UART |
| J15 | D3 | UART_RTS | Select to connect D3 for Arduino with RTS pin(hardware flow control) for ATSAMD21 UART |
| J9 | D14 | SCL | Select to connect SCL pin for ATSAMD21 I2C with SCL pin for Grid-EYE sensor. |
| J12 | D15 | SDA | Select to connect SDA pin for ATSAMD21 I2C with SDA pin for Grid-EYE sensor. |
| J8 | D7 | INT | Select to connect Arduino data pin D7 with Grid-EYE's interrupt signal INT. |
| J6 | 5V | D2 negative pole | Select 5V power from Arduino board. |
| J11 | 3.3V | VDD3.3 | Select 3.3V power from Arduino board. |
| J14 | D6 | RESET | Select to connect D6 for Arduino with Reset pin for PAN1740 |
| J18 | GND | PA15 | Select to connect PA15 for ATSAMD21 to ground. |

Jumper settings:

1. J7 and J10 are used to isolate the UART port for the ATSAMD21 microcontroller when programming the Bluetooth module PAN1740, or engage the board into Arduino mode.

2. J9 and J12 are used to set up the evaluation kit into either independent mode or Arduino mode. When J9 and J12 are in-situ, the sensor and ATSAMD21 are connected via $I^2C$ and the board works in independent mode. Removing the two jumpers will enable the Arduino mode when the Grid-EYE board is hosted onto the Arduino board. If not hosted onto the Arduino board and jumpers are removed unexpected and undefined data will be received and/or transmitted.

3. When programming ATSAMD21 with SAM-BA, J18 is placed in-situ to update the bootloader or start the application. By having the jumper J18 connected and the reset button SW1 pressed, ATSAMD21 will be ready for updating the bootloader.

# 4 Development with Evaluation Kit

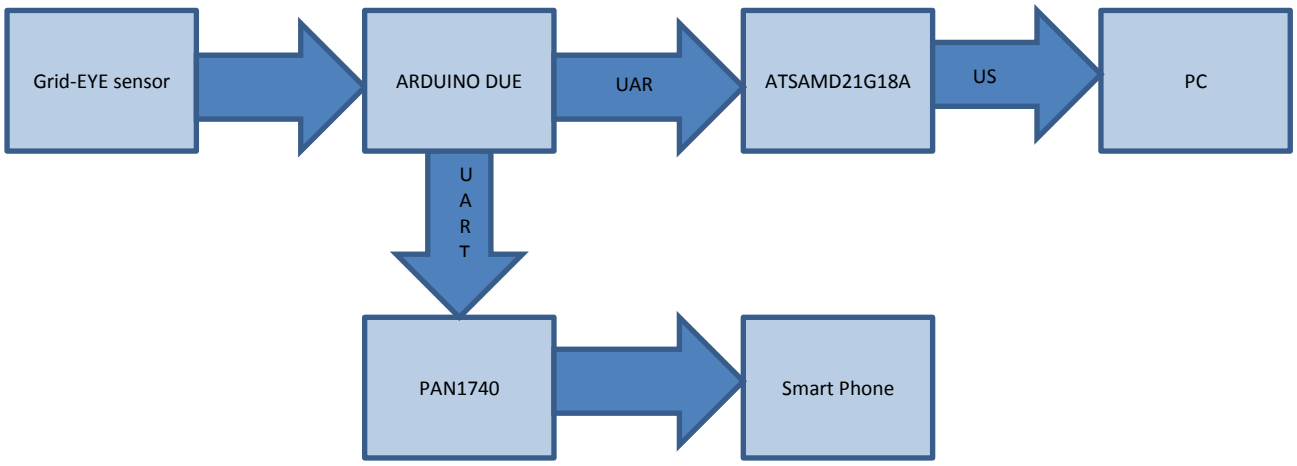
For a customized firmware development on the evaluation kit, it is important for the developer to know the Firmware architecture of the kit in two different modes. This section explains this in detail.

## 4.1 Firmware architecture

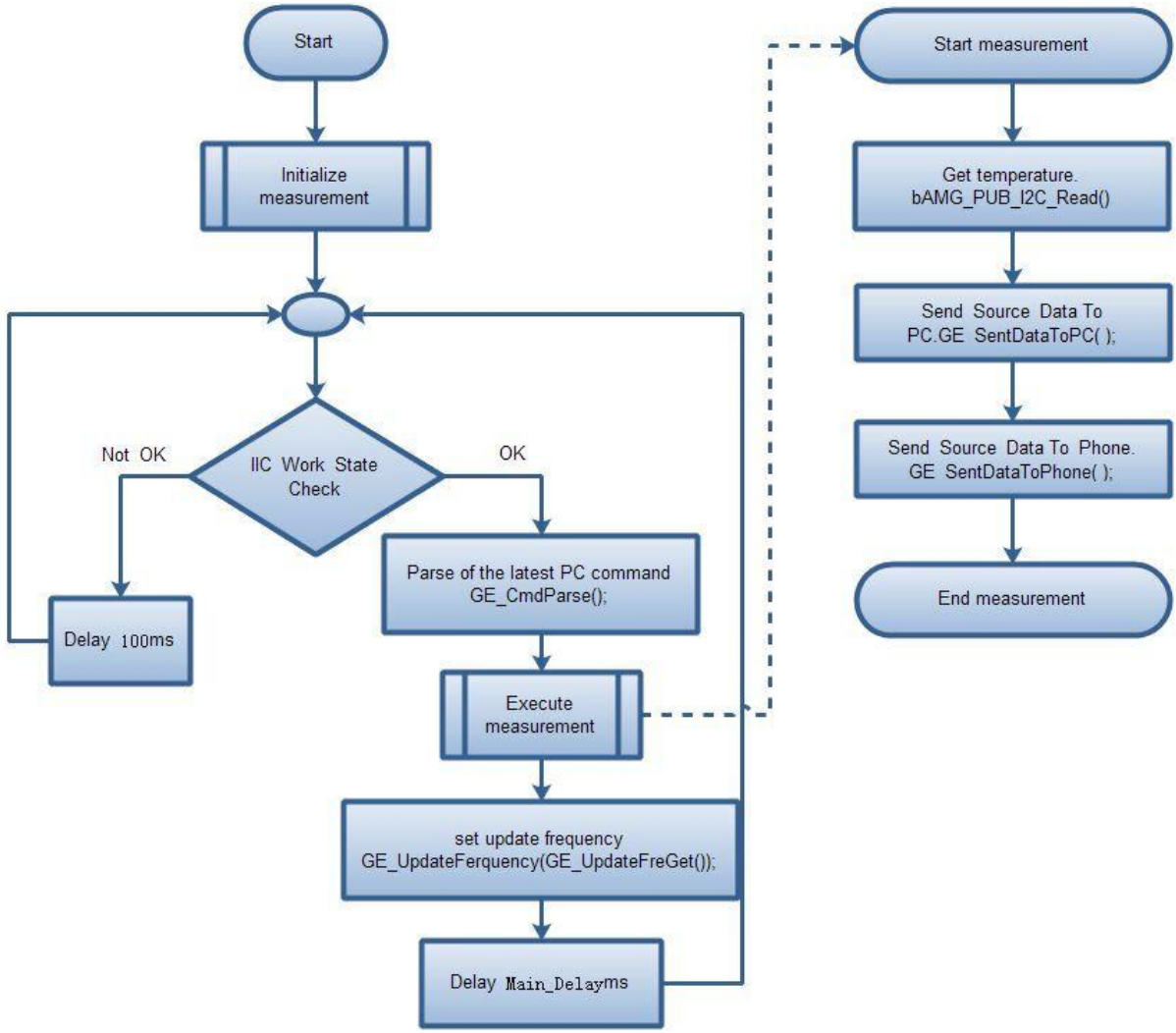
As explained earlier, there are two modes that the board can be used in. Independent mode, and Arduino mode.

### 4.1.1 Independent Mode

The following block diagram illustrates the independent mode of operation for the evaluation kit, utilizing the standard communications protocols:



In the independent mode, data sampling and transfer will be executed by the ATSAMD21 microcontroller ; the program flow diagram is given below:

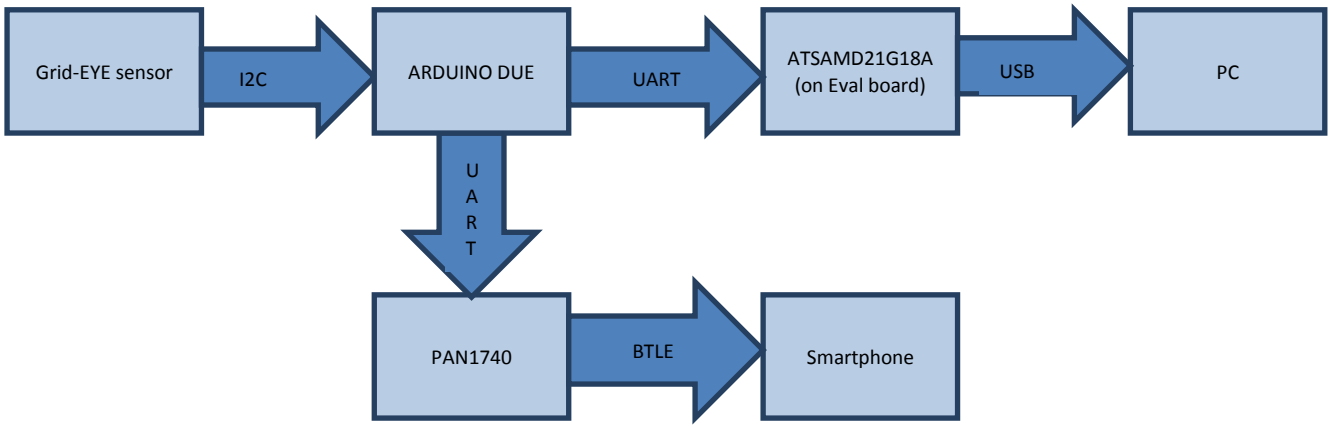



Flow-chart steps explained:

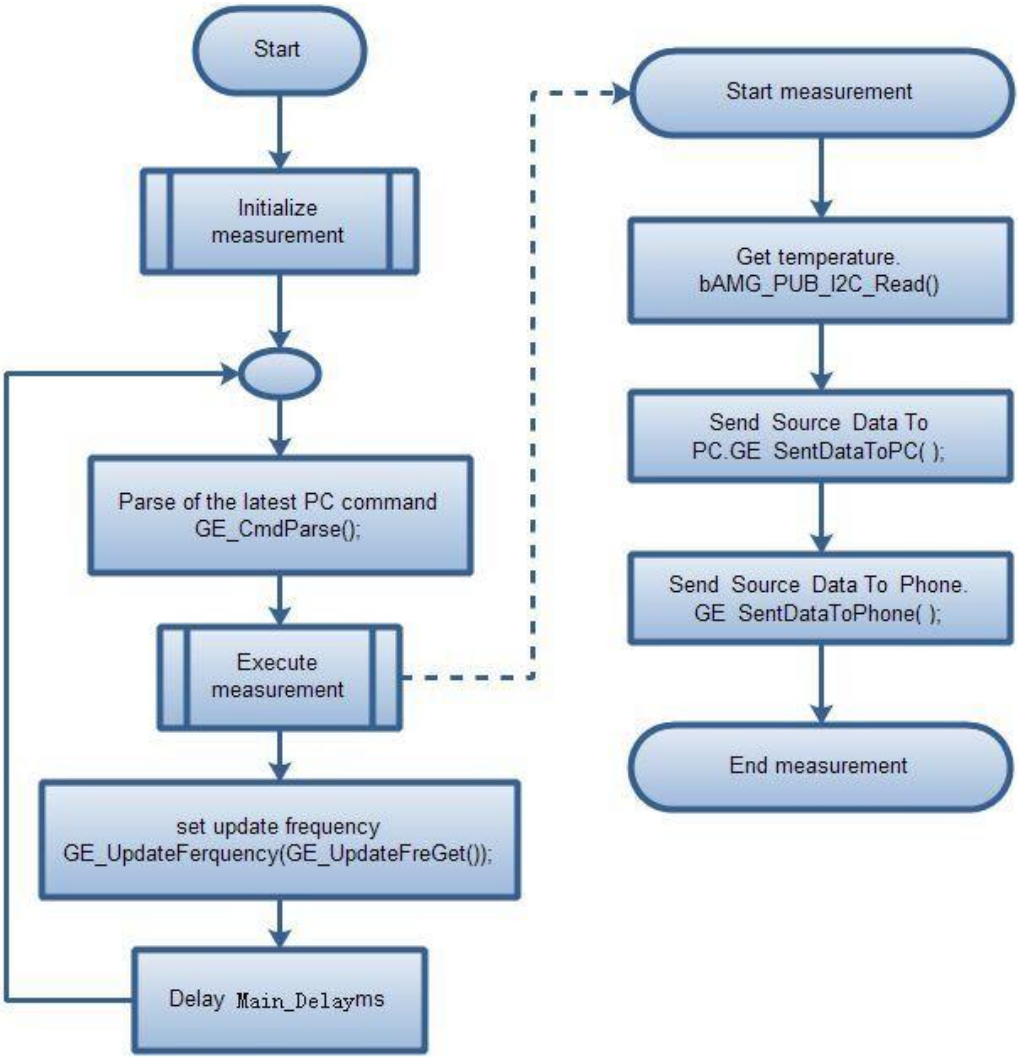
- Decision point - check $I^2C$ response of Grid-EYE sensor:
  - If valid, Independent mode is confirmed.
  - If invalid, Arduino mode is confirmed.
    - Delay of 100ms is applied for periodic inspection of $I^2C$. This allows the microcontroller to determine mode of operation.
- Parse the command from PC, such as the command of setting the sampling frequency.
- Measurement - read data from the sensor and send it to PC and smartphone.
- Updating frequency - if the sampling frequency is updated, then reset it.
- Delay applied in the loop, determined by the sampling frequency.

### 4.1.2 Arduino Mode

The following block diagram illustrates Arduino mode of operation for the evaluation kit with standard communication protocols:



In the Arduino mode, data sampling and transfer will be executed by Arduino mother board; the program flow diagram is shown below:




Flow-chart steps explained:

- Parse the command from PC, such as the command of setting the sampling frequency.
- Measurement - Read data from the sensor and send it to PC and smartphone.
- If the sampling frequency is updated, then reset the sampling frequency.
- Delay applied in the loop, determined by the sampling frequency.

## 4.2 Firmware development

For the two modes of operation, independent and Arduino mode, we will explain separately the development process. We will also give a brief introduction in this section on the programming of the Bluetooth module built on the evaluation kit.

### 4.2.1 Development Tools

The following tools are needed when developing application for Grid-EYE Sensor board.

**Hardware**

1. PC with at least 2 USB interface
2. Micro-USB cables
3. TTL Serial to USB module (only to program Bluetooth module PAN 1740)
4. J-Link

**Software**

Users need to install the following software according to the target they develop:

| Software | Description | Download link |
|---|---|---|
| Atmel Studio | Develop the code for ATSAMD21 | http://www.atmel.com/tools/ATMELSTUDIO.aspx |
| SAM-BA | Program ATSAMD21, if JTAG is not available | http://www.atmel.com/tools/ATMELSAM-BAIN-SYSTEMPROGRAMMER.aspx |
| Arduino IDE | Develop the code for Arduino mother board | https://www.arduino.cc/en/Main/Software |
| Keil MDK | Develop the code for Bluetooth module | http://www.keil.com/arm/mdk.asp |
| Smart Snippet | Program Bluetooth module | http://support.dialog-semiconductor.com/product/da14580 |

### 4.2.2 Development on ATSAMD21

The demonstration software code project for ATSAMD21 is created using ATMEL studio. The main function of the code is data acquisition and transmission. Both the operating modes are supported by just one firmware code. So switching between the independent mode and Arduino mode does not need changing the code in ATSAMD21. The firmware decides on the mode by the response of the $I^2C$ interface.

There are two ways to download the program to ATSAMD21:

- If you have a JTAG debugger, like a J-link, you can download the program with IDE or other tools
- But if you don't have J-link and/or you want to download the program through USB interface with SAM-BA, the bootloader must be downloaded into the MCU before downloading application. Thus you need to modify the linker script before building the project to tell the linker how to allocate the address of the bootloader and Application.

Linker script is located in the following path:

SAMD21_USB_DUART_DEMO/src/ASF/sam0/utils/linker_scripts/samd21/gcc/samd21j18a_flash.ld

Modify the files as follows:

```
/* Memory Spaces Definitions */
MEMORY
{
  rom      (rx)  : ORIGIN = 0x00002000, LENGTH = 0x00038000
  ram      (rwx) : ORIGIN = 0x20000000, LENGTH = 0x00008000
}
```

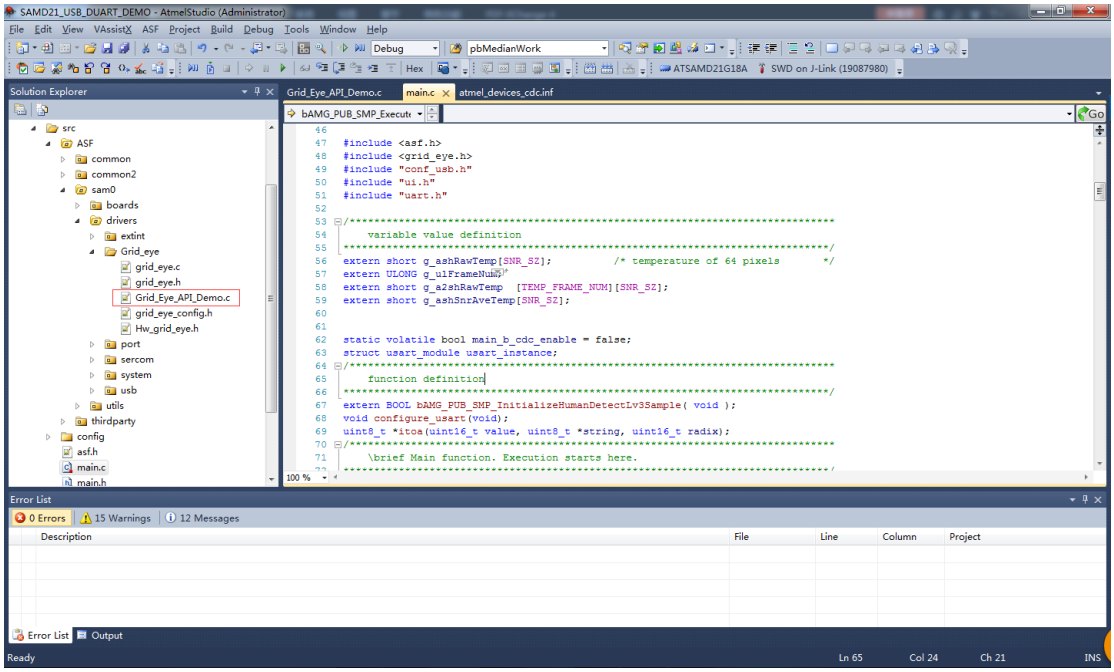
The ORIGIN value needs to be modified to 0x00002000 to leave a space for bootloader.

Constraints in using SAM-BA with USB/UART requires that the bootloader or any access to memory in the ATSAM21 series be made from 0x00002000 onwards.

For more details, refer to: Grid_Eye_Source\Atmel\BOOTLOADER\Atmel-42366-SAM-BA-Bootloader-for-SAM-D21_ApplicationNote_AT07175.pdf

### 4.2.3 Development with Grid-EYE APIs

For the development with the APIs Atmel studio will be needed. This can be downloaded as mentioned above and the detailed guide can be accessed on Atmel's official website: http://www.atmel.com/microsite/atmel_studio6/




The file "Grid_Eye_API_Demo.c" provides the methods of using Grid-EYE's 3 layers API. Users can try the object detection and human body detection functions via the serial debug assistant.

#### *4.2.3.1 Introduction to API Lib*

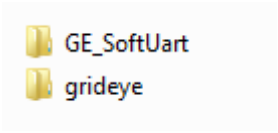
Grid-EYE API Lib is divided into 3 layers; users can select API functions from these layers according to the requirement.

- API Lv1: APIs from this layer implement Grid-EYE data acquisition, transformation of temperature value and data format.
- API Lv2: APIs from this layer implement filtering of original data, and provide functions for image processing, object detection, and human body recognition.
- API Lv3 (binary code): APIs from this layer implement functions for object detection and object tracking

### 4.2.4 Development on Arduino

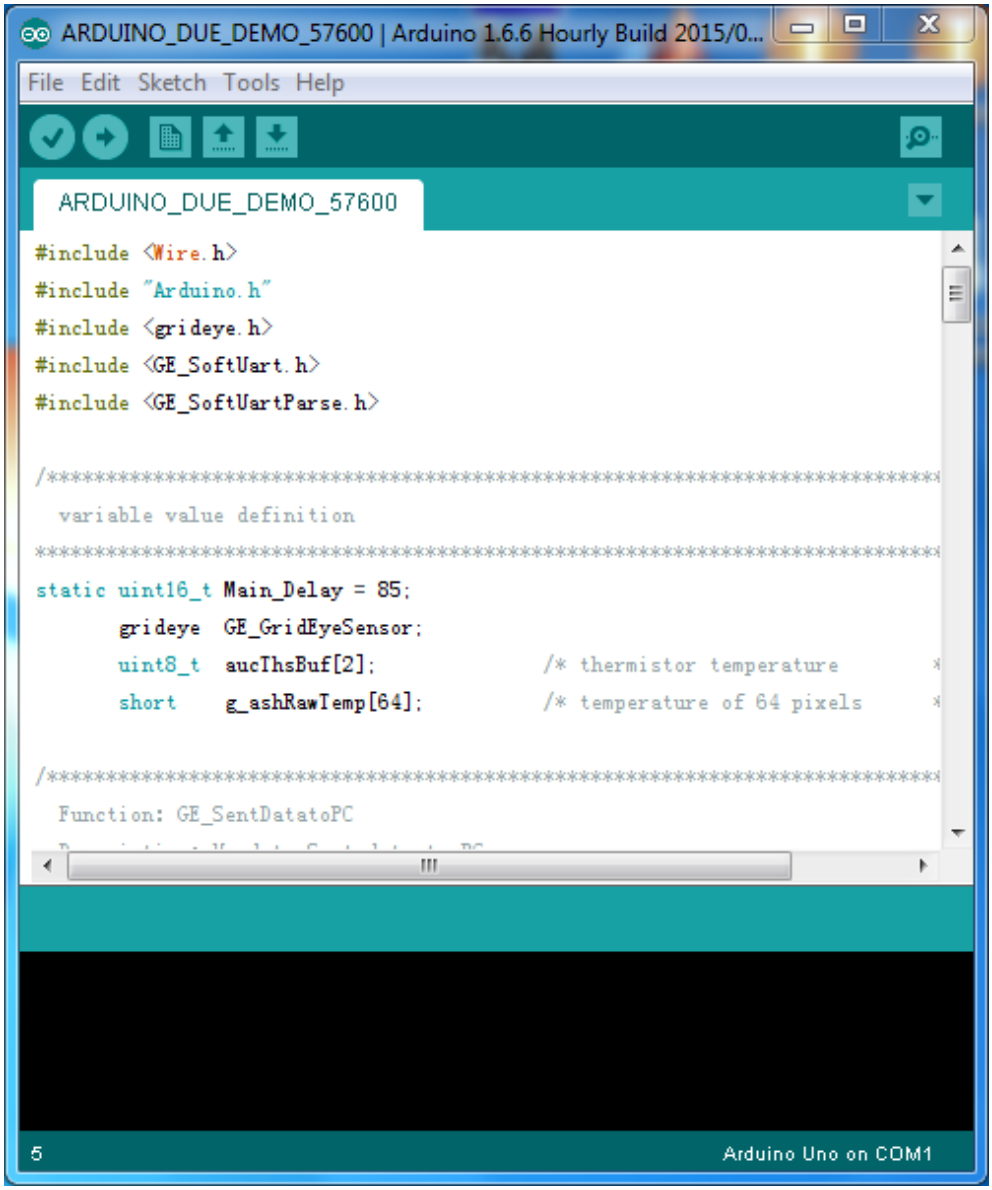
In order to be compatible with the level of 3.3V standard, we provide the demonstration program with libraries for Arduino-DUE board. If users have access to other Arduino boards, then some porting work will need to be done.

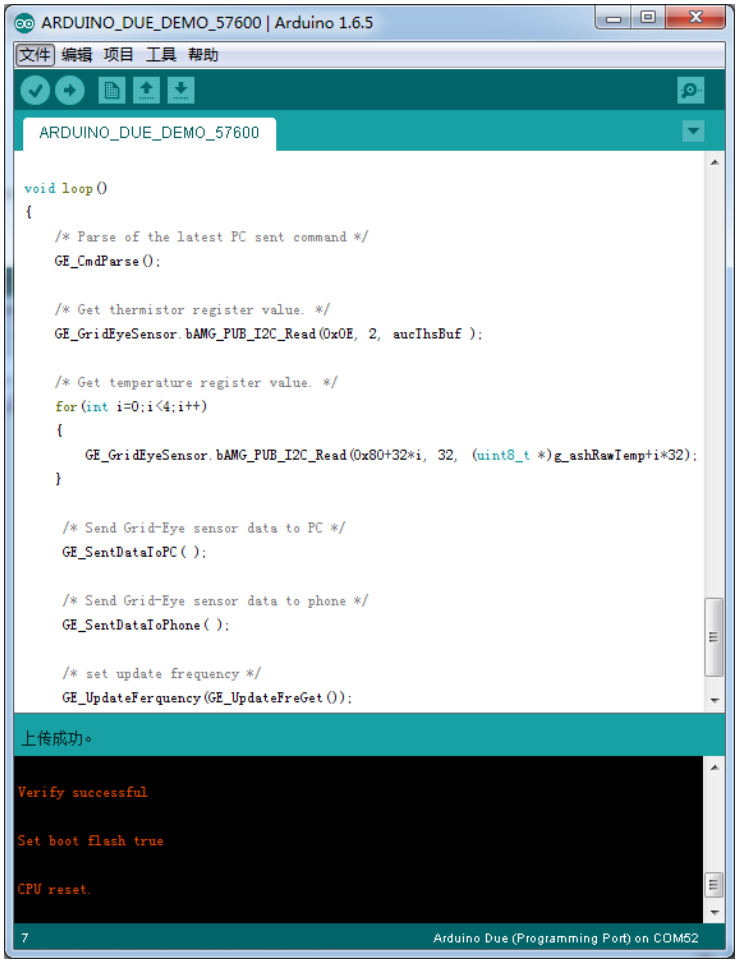
To run the demonstration, two libraries, GE_SoftUart and Grid-EYE we provided need to be copied to the Arduino libraries directory: arduino-nightly-windows\arduino-nightly\libraries




Open the *.ino file and select the corresponding target board before you start the work:

Compile the code and upload it on the board.



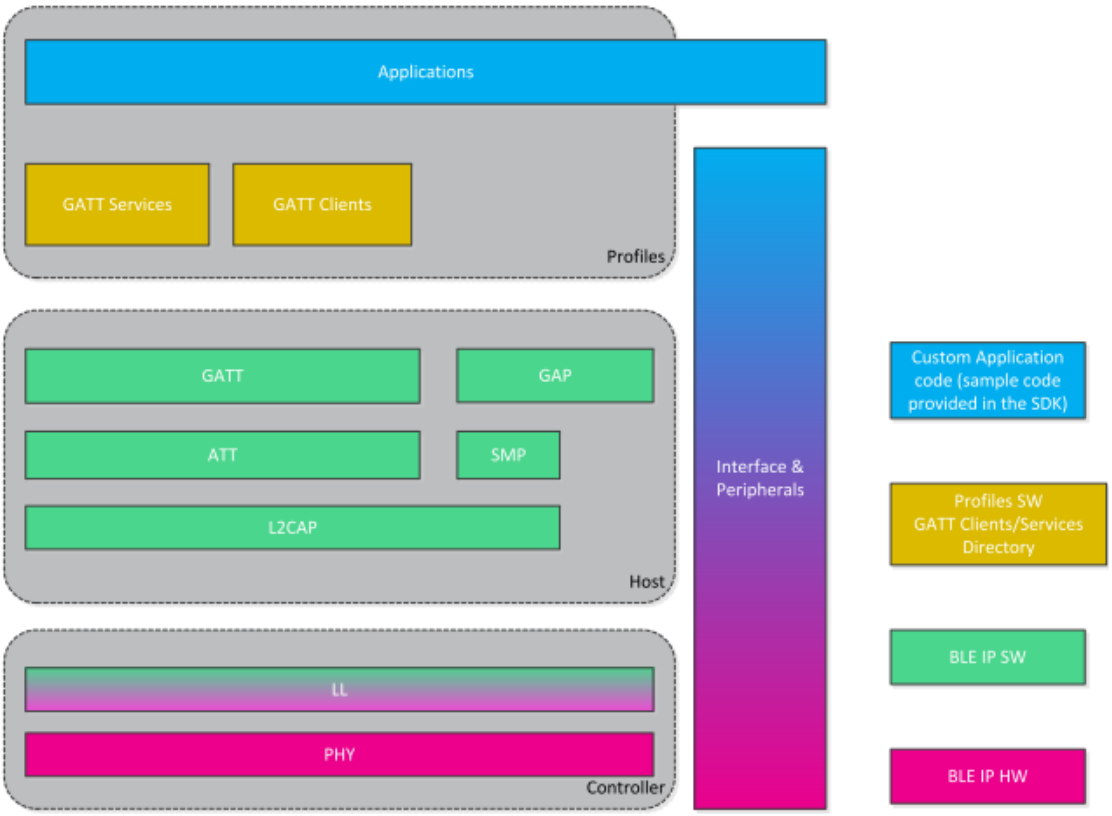

ARDUINO_DUE_DEMO_57600 | Arduino 1.6.5
文件 编辑 项目 工具 帮助
ARDUINO_DUE_DEMO_57600
void loop()
{
/* Parse of the latest PC sent command */
GE_CmdParse();
/* Get thermistor register value. */
GE_GridEyeSensor.bAMG_PUB_I2C_Read(0x0E, 2, aucIhsBuf );
/* Get temperature register value. */
for(int i=0;i<4;i++)
{
GE_GridEyeSensor.bAMG_PUB_I2C_Read(0x80+32*i, 32, (uint8_t *)g_ashRawTemp+i*32);
}
/* Send Grid-Eye sensor data to PC */
GE_SentDataToPC( );
/* Send Grid-Eye sensor data to phone */
GE_SentDataToPhone( );
/* set update frequency */
GE_UpdateFerquency(GE_UpdateFreGet());
上传成功。
Verify successful
Set boot flash true
CPU reset.
7
Arduino Due (Programming Port) on COM52

### 4.2.5 Development on PAN1740

The Bluetooth module is PAN1740, which uses DA14580 as the main controller. The API lib we used in development is: DA14580_581_SDK_3.0.8.0

For the detail of this protocol stack, you can refer to Dialog Semiconductor's official website: http://support.dialog-semiconductor.com/

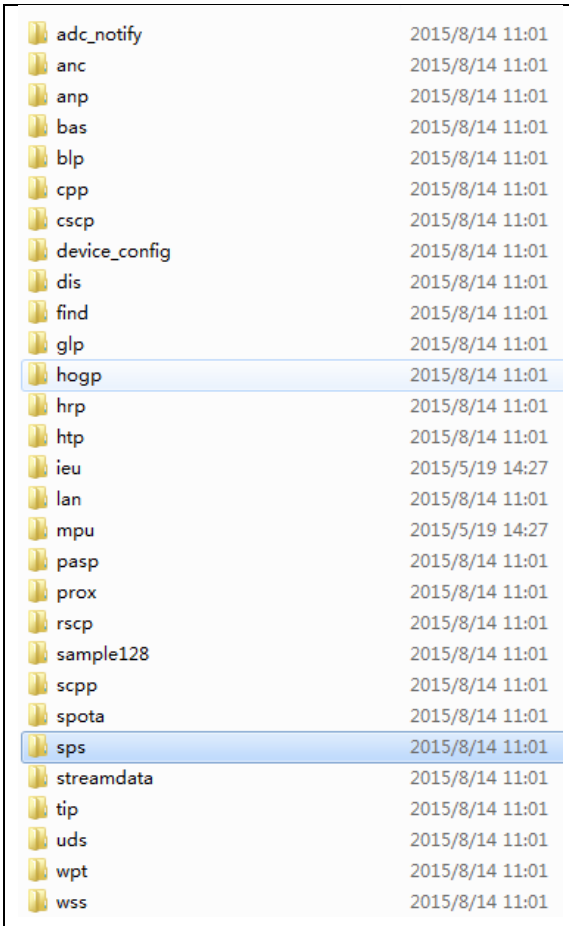
Block diagram as follows:



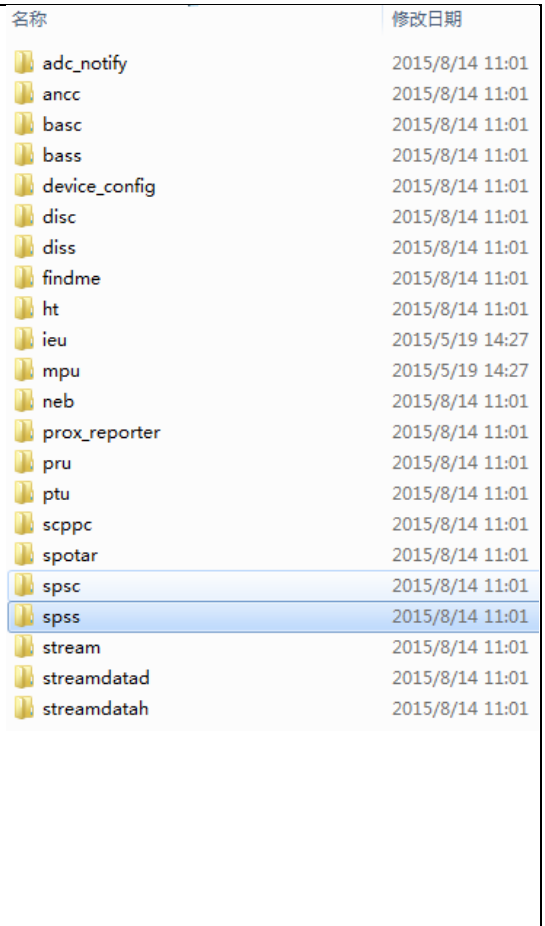

The BLUE stack and application are based on RivieraWaves Kernel OS. The "Applications" part is our application program. The BLE stack part is provided as binary code which was burnt onto the chip. Dialog Semiconductor does not provide open access to its BLE protocol stack source code but users can apply API's provided to develop their applications.

To develop the Bluetooth firmware, you need to add the Profile to the project. The profile in our demonstration is 'SPS'(Serial Port Service) receive application.

Below is the directory for the corresponding profile:

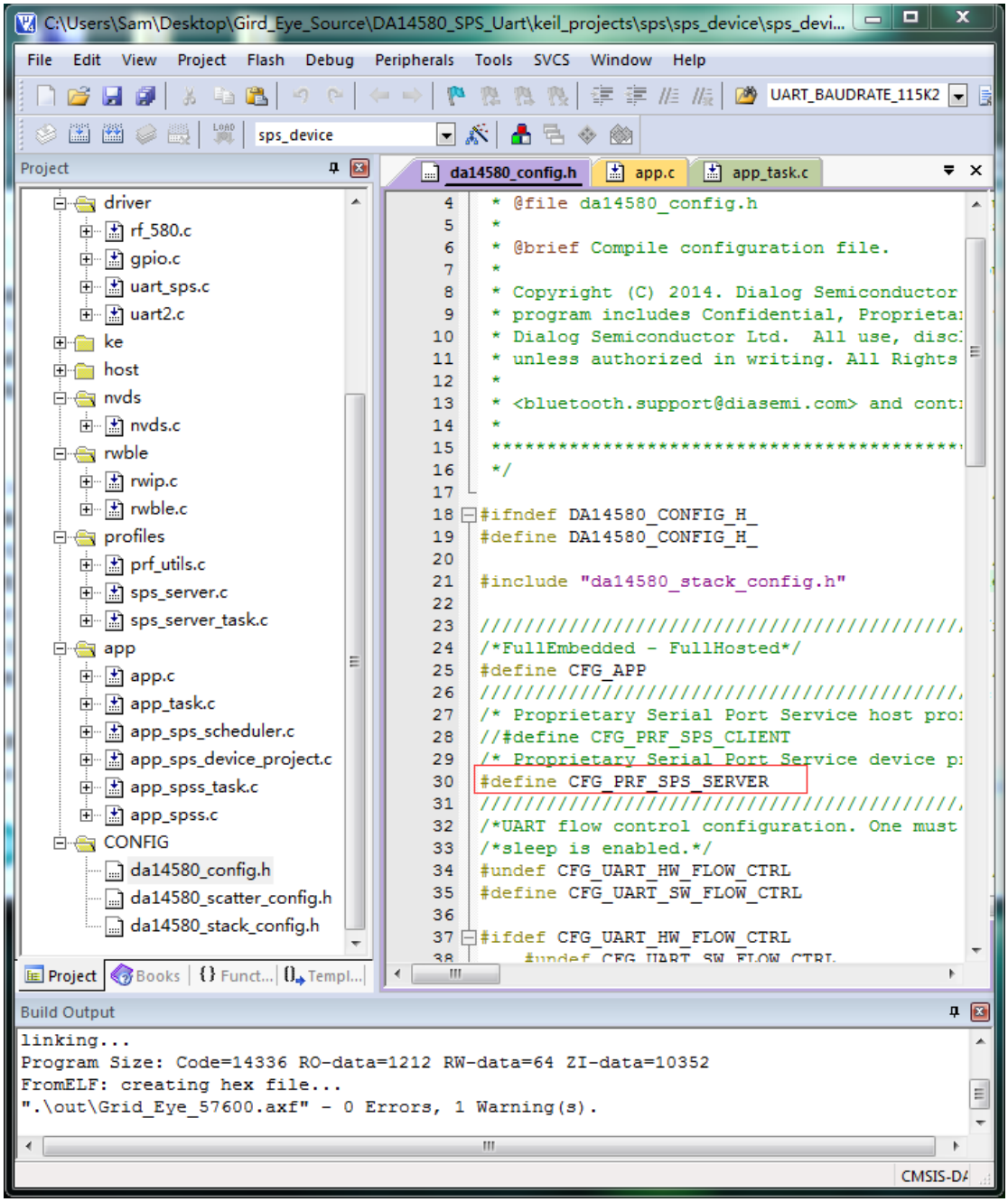



src\ip\ble\hl\src\profiles




src\modules\app\src\app_profiles

Add related file to project, then un-comment corresponding macro definition in “da14580_config.h”, and write your ‘app’ code.



## 4.3 Updating firmware

### 4.3.1 Use USB interface to update ATSAMD21G18A

**Tools and Software**

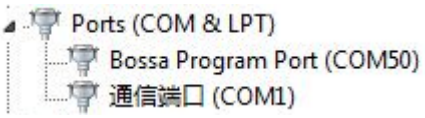
- Micro-USB cable
- Software: SAM-BA v2.15

**How to program**

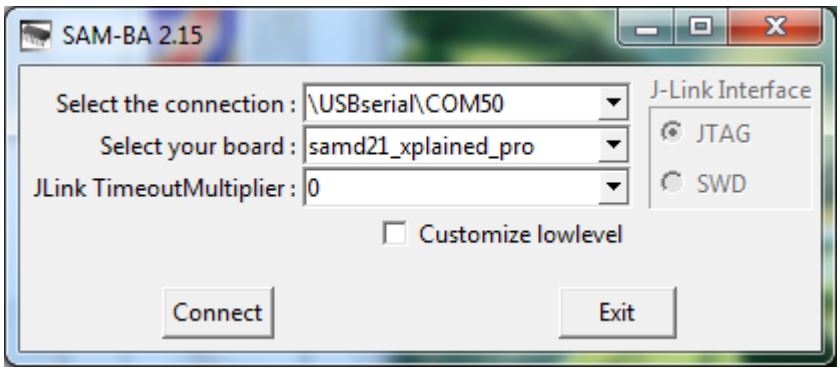
1) Connect USB to PC, set the jumpers, press the reset button SW1.

| Jumper Number | J12 | J9 | J7 | J10 | J18 |
|---|---|---|---|---|---|
| Status | ON | ON | ON | ON | **ON** |

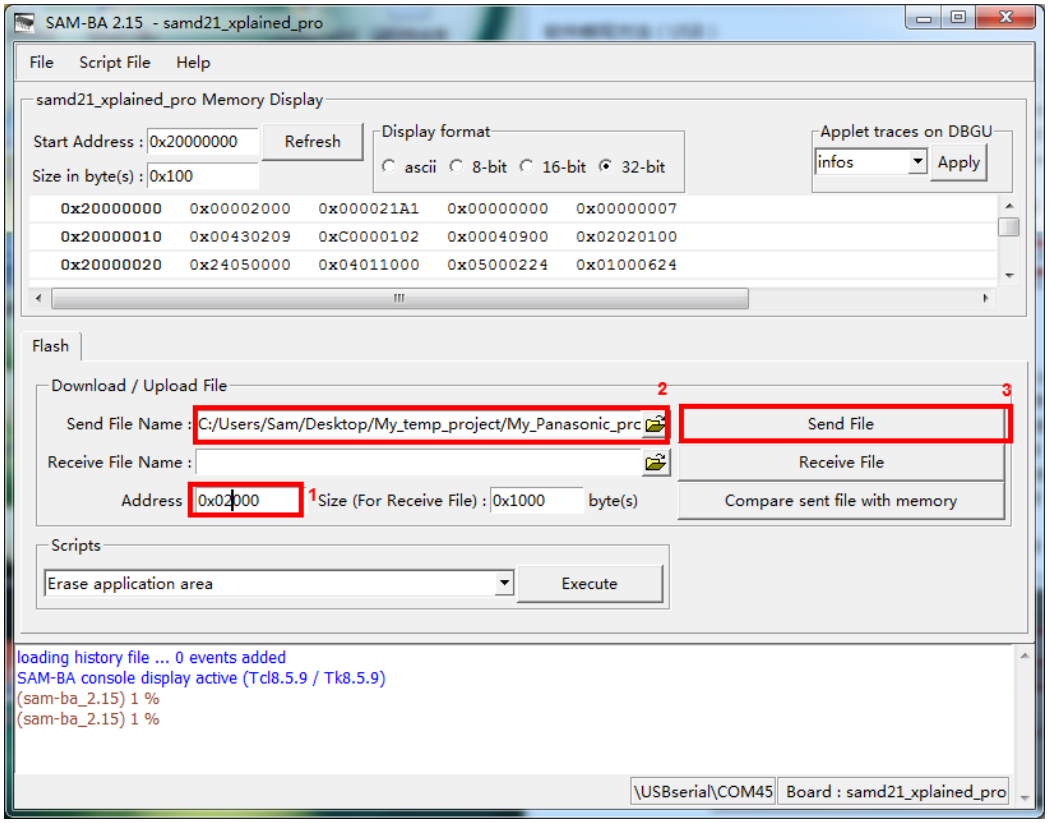
2) Open device manager to check whether there is USB CDC virtual COM. You should see the" Bossa Program Port".You need to remember the COM id that will be used in the following steps.



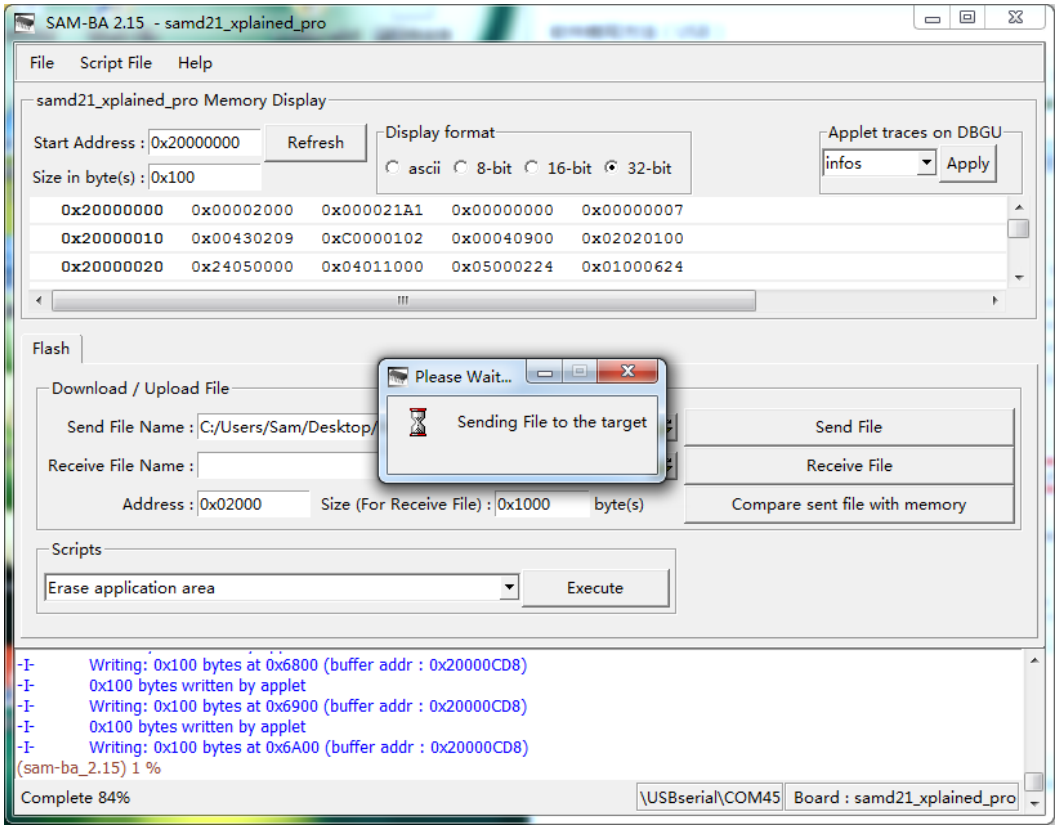

3) Open SAM-BA, select the COM id, SAMD21_xplained_pro, and then click "Connect ".



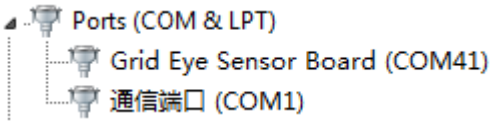

Configure the program address, select the bin file (**project path given below)** and then click "Send File". **<Grid-EYE\Source\ATSAMD21G18A\ATSAMD21G18A_USB_DUART_DEMO\SAMD21_USB_DUART_DEMO\Debug\SAMD21_USB_DUART_57600.bin>**




Program process:



4) Disconnect the J18, press the reset button SW1, open device manager to check if the name of CDC virtual COM changed to “Grid Eye Sensor Board (COM x)”.




If the device manager shows as above, it means that Update ATSAMD21G18A finished successfully.

### 4.3.2 Use Serial interface to update PAN1740

**Tools and Software**

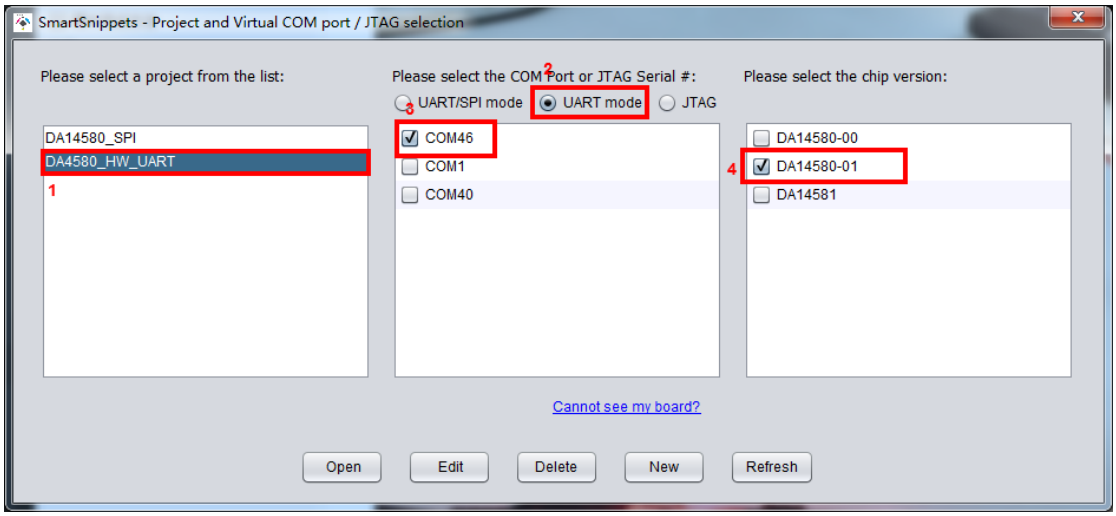
- Download tools: USB to serial module
- Software: SmartSnippets

**How to program**

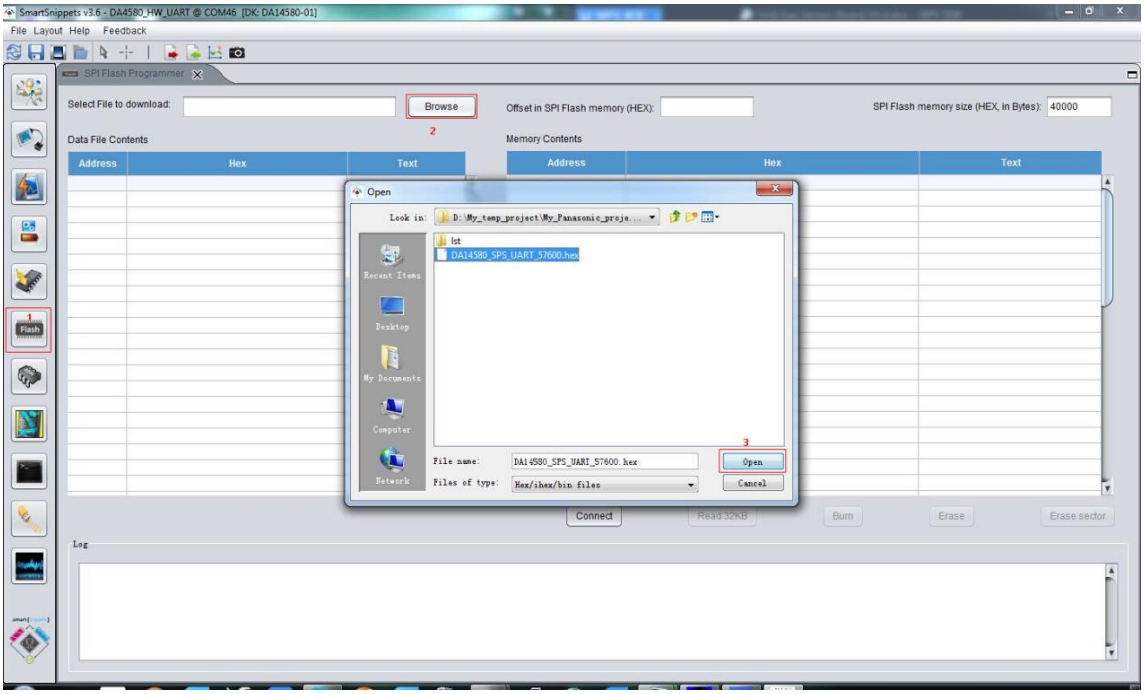
1) Connect USB to PC, set the jumpers as following, connect the TX pin on Grid-EYE sensor board with RX pin of USB to serial module, and connect the RX pin on Grid-EYE sensor board with TX pin of USB to serial module.

| Jumper Number | J12 | J9 | J7 | J10 | J18 |
|---|---|---|---|---|---|
| Status | x | x | OFF | OFF | x |

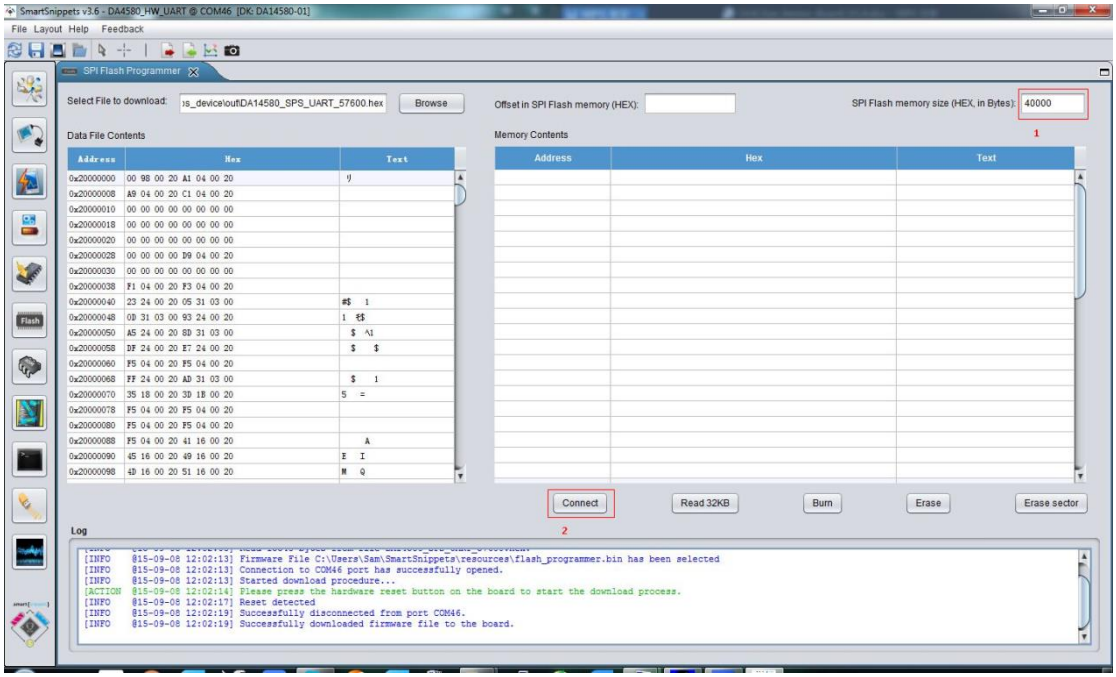
2) Create a download project, select UART mode, corresponding COM port, and chip version:




3) Select SPI FLASH Programmer, and then select the file to download.



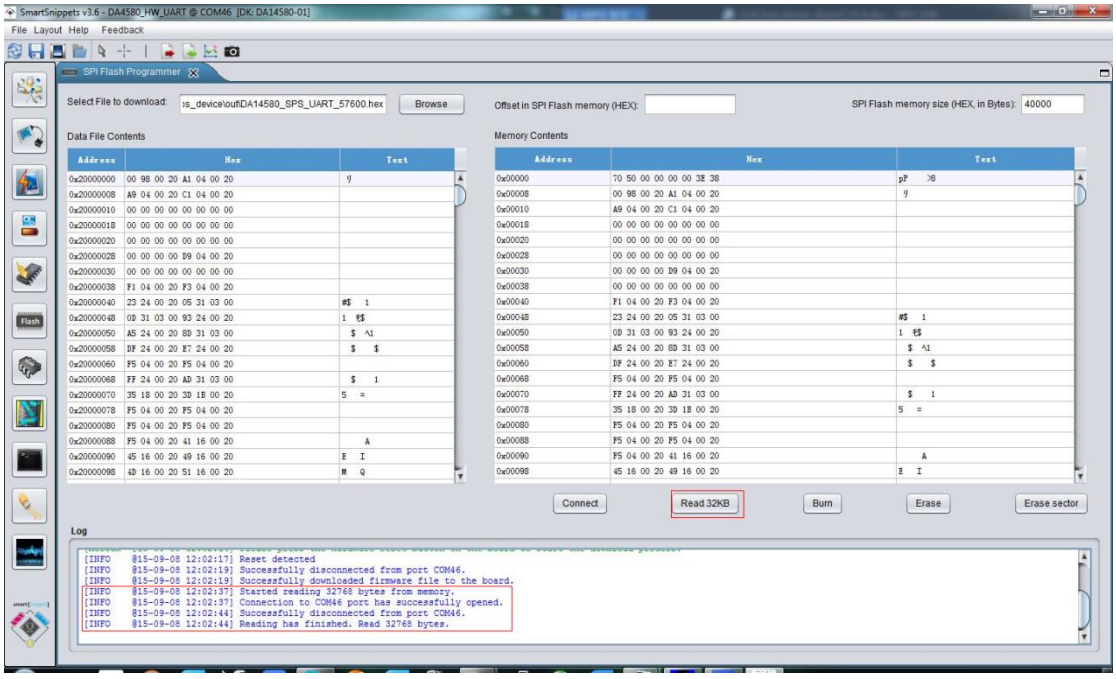
4) After opening the file, configure the SPI Flash memory size to be 40000, then click “Connect” button.



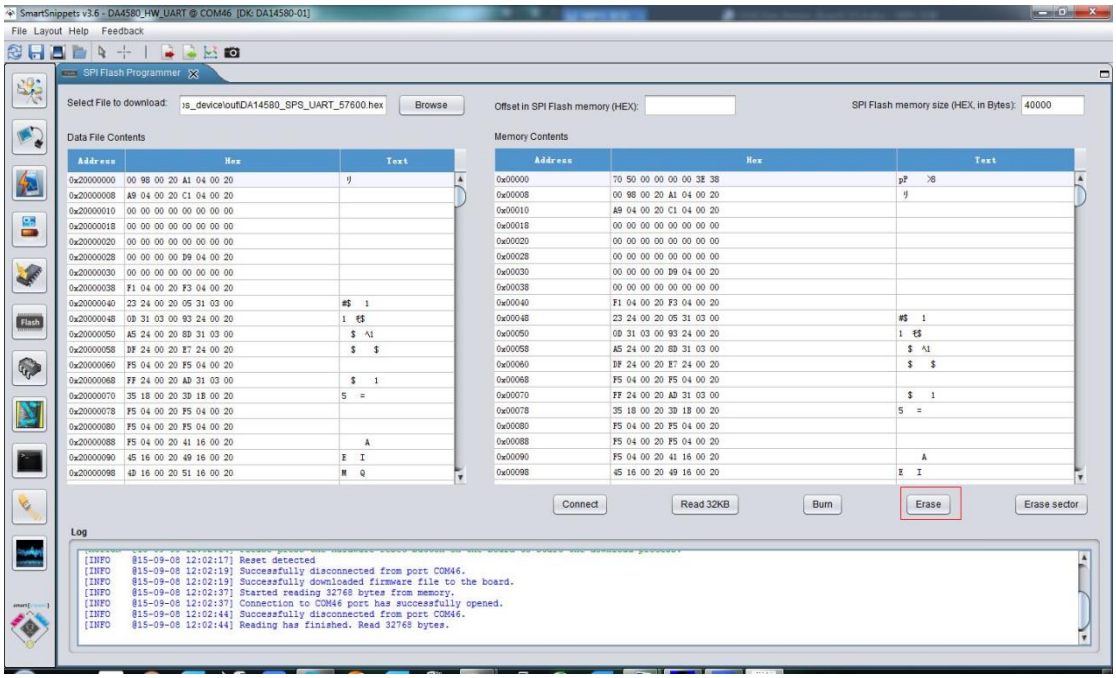

After clicking “Connect” button, the software will remind you to reset the Bluetooth module so we need to press reset button SW2 to reset the Bluetooth module.

```
[INFO    @15-09-08 12:02:13] Firmware File C:\Users\Sam\SmartSnippets\resources\flash_programmer.bin has been selected
[INFO    @15-09-08 12:02:13] Connection to COM46 port has successfully opened.
[INFO    @15-09-08 12:02:13] Started download procedure...
[ACTION  @15-09-08 12:02:14] Please press the hardware reset button on the board to start the download process.
```

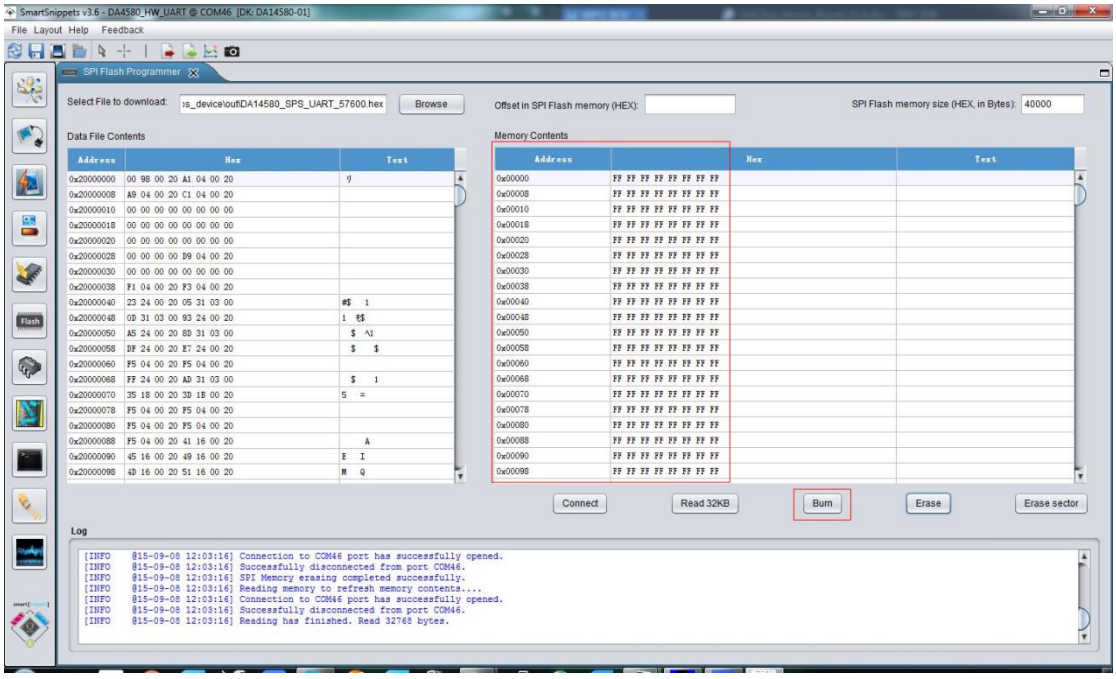
5) If the connection is successful, there will be a prompt message in the Log window. Once you see this click “Read 32KB” button.



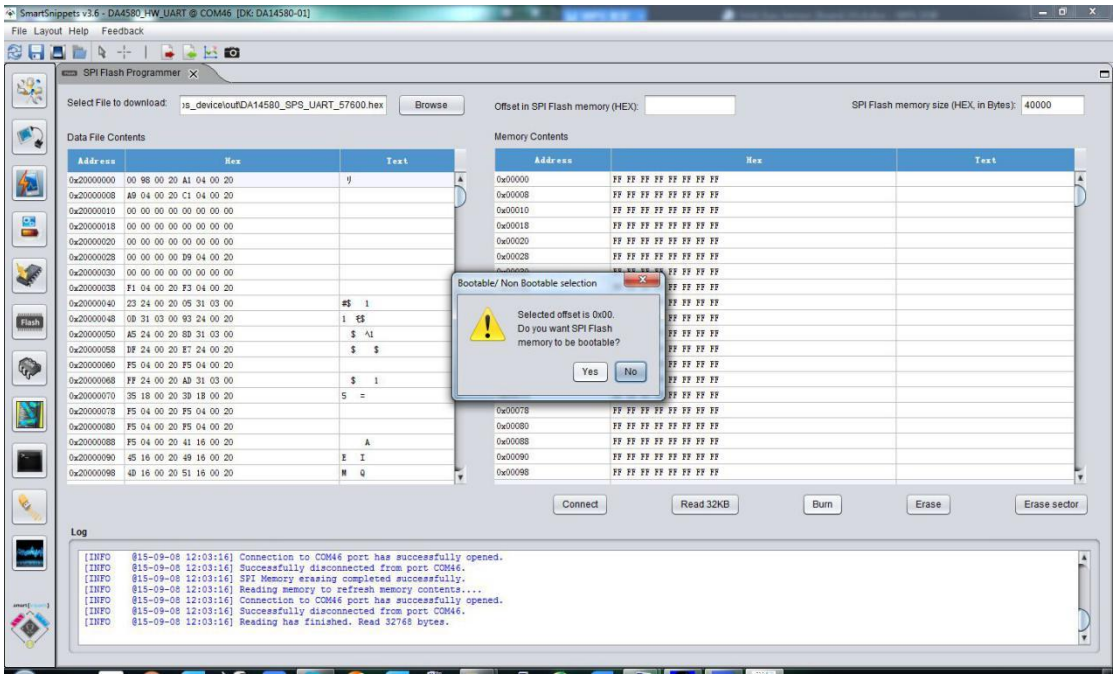
6) Then click “Erase” button after the memory is read.



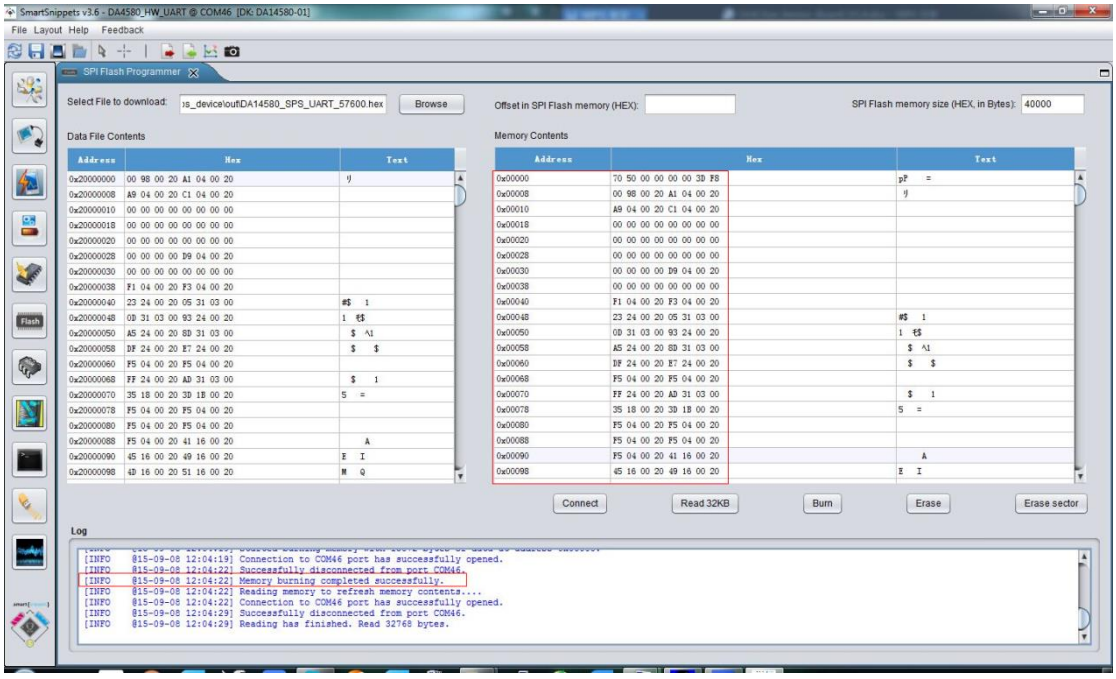

7) After erase has been finished, click “Burn” button.



8) A pop-up window comes out after you click “Burn”, select Yes.




9) You will see “Memory burning completed successfully” info if everything goes well.




It means that Update PAN1740 finished successfully.

# 5 Grid-EYE Demonstration Software for PC

In this section we talk about the software that is provided with the eval-kit to demonstrate the results from the sensor. We explain here how to install this software and then run it.

## 5.1 Preparation

To run this demonstration, you need to:

- Install the USB driver for Grid Eye sensor board
- Install the LabVIEW program to show the temperature image
- Install the DSPS application on mobile phone to connect the Bluetooth module and show the received data

### 5.1.1 Jumper Setting

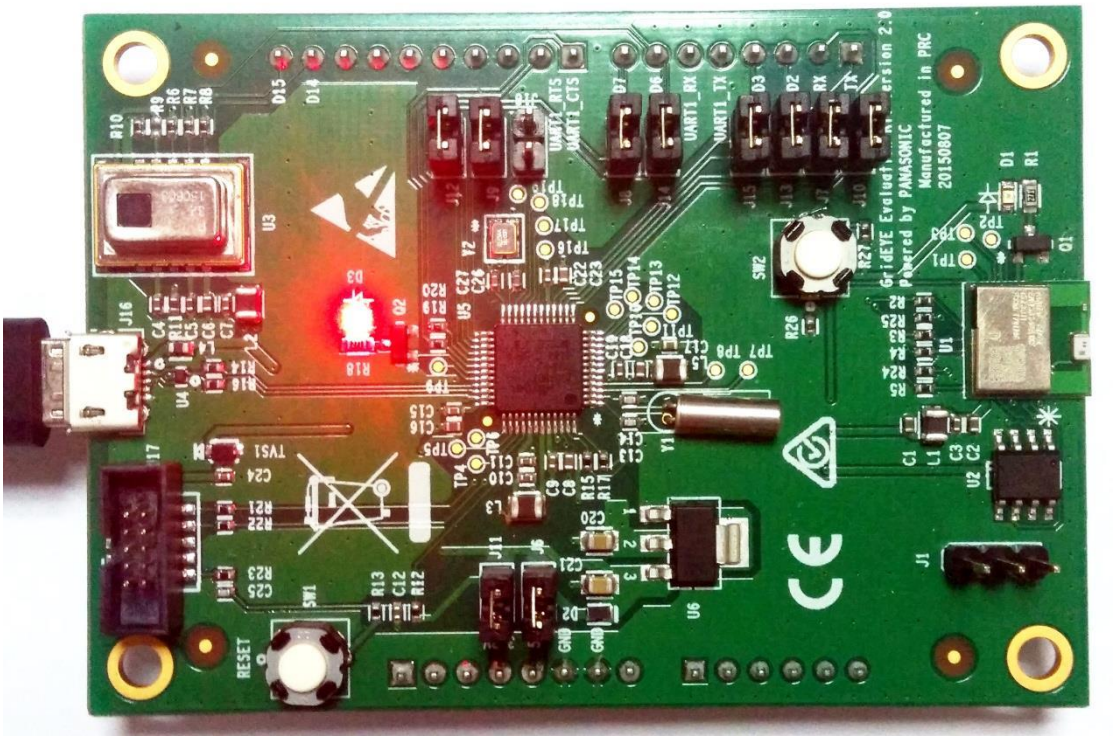
Operation mode can be switched through open and close the following jumper:

| Jumper Number | J12 | J9 | J7 | J10 | J18 |
|---|---|---|---|---|---|
| Independent Mode | ON | ON | ON | ON | OFF |
| Arduino Expansion Mode | OFF | OFF | ON | ON | OFF |

## 5.2 Demonstration

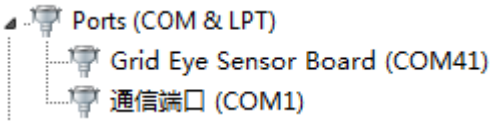
### 5.2.1 Independent Mode Demonstration

1) Connect USB to PC, set the jumpers, and check if LED D3 starts to blink.



Note: If LED D3 blinks every second, it indicates that USB device is recognized correctly by the PC. If the LED does not blink at this frequency, it indicates that USB does not work normally, please check the USB driver and USB cable.

2) Open device manager to check the COM id for USB virtual COM



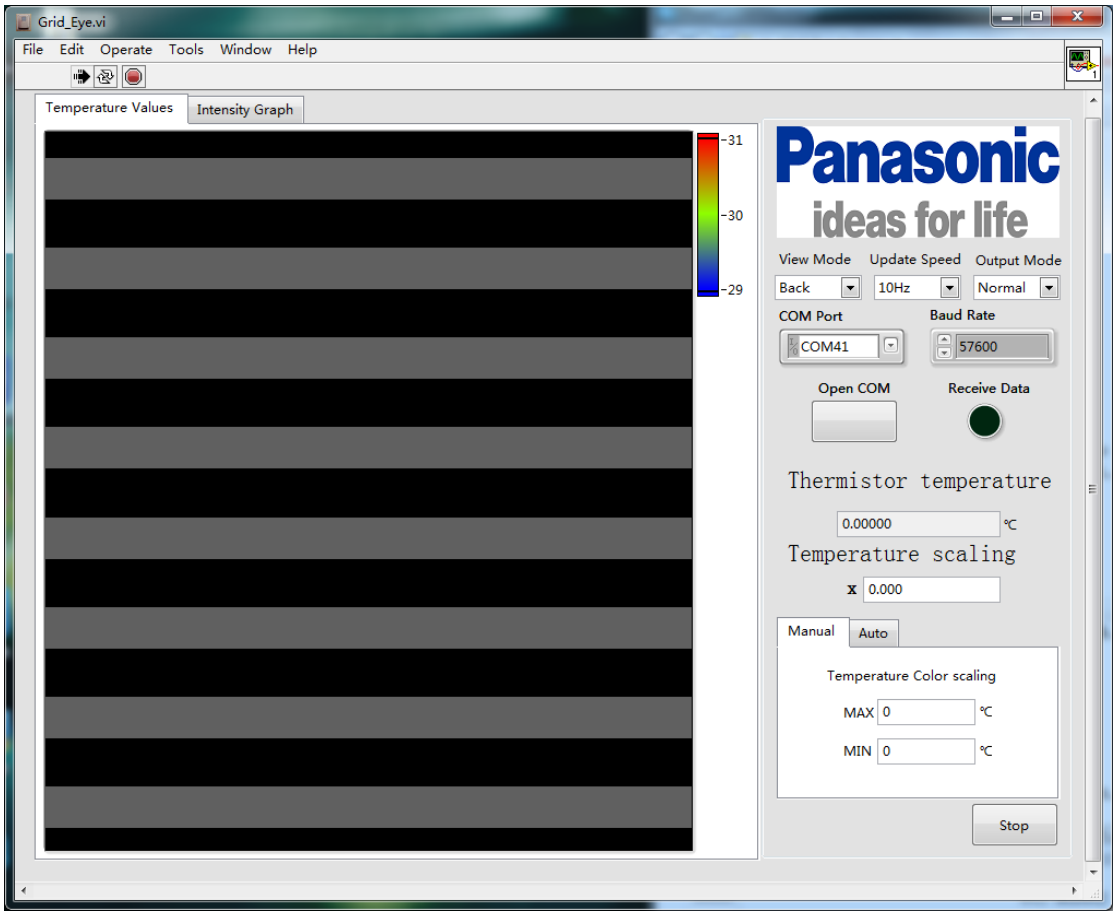

If the COM port is not detected then reinstall the USB driver from **na.industrial.panasonic.com/grideye-evalkit** under

Software & Source Code for Download > USB Driver > ATSAMD21G18A\ATSAMD21G18A_USB_DUART_DEMO\SAMD21_USB_DUART_DEMO

(the files used are: atmel_devices_cdc.cat and atmel_devices_cdc.inf).

3) Run Grid-EYE application (Windows Start>>Grid-EYE>>Open Grid-EYE application) If compatibility issues are encountered then reinstall the LabVIEW Run-Time Engine 2014 from www.ni.com or from the supplied folder with appropriate 32bit or 64bit versions.

4) Now select the appropriate COM port (shown as COM41 in the image below), and click 'Open COM' button to view the data fed to the PC from the Grid-EYE sensor.




Temperature data detected:

Temperature values can be observed on the LabVIEW (8 x 8) matrix window. Colours for the heat map can be set between -20°C and +100°C. The second tab is showing an interpolation of the raw signal.

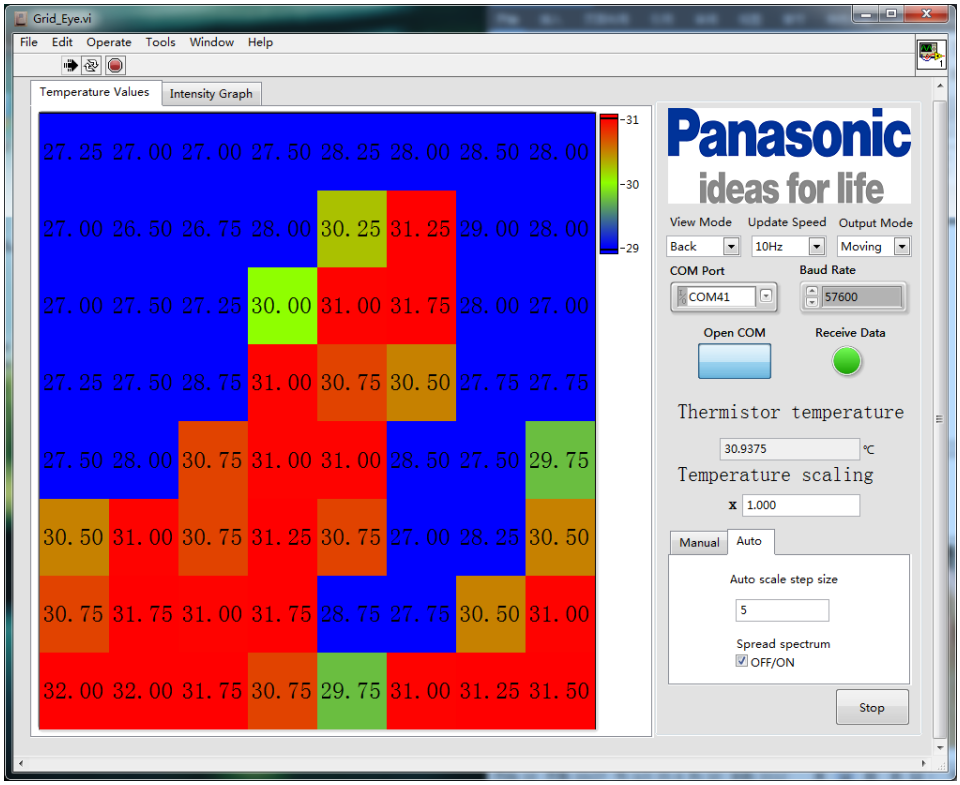
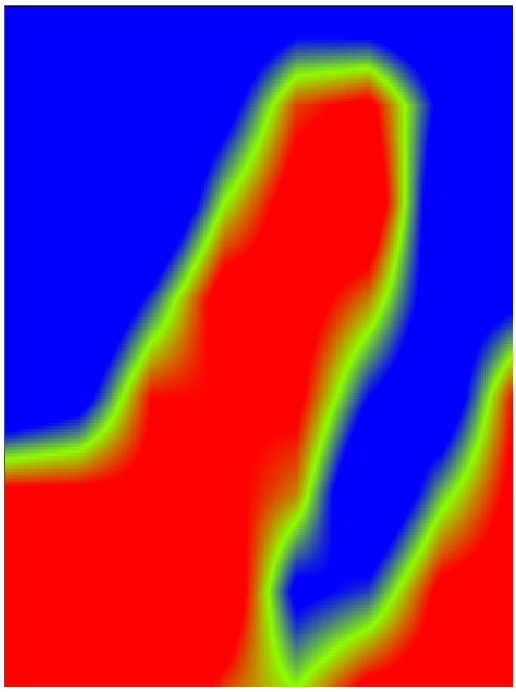
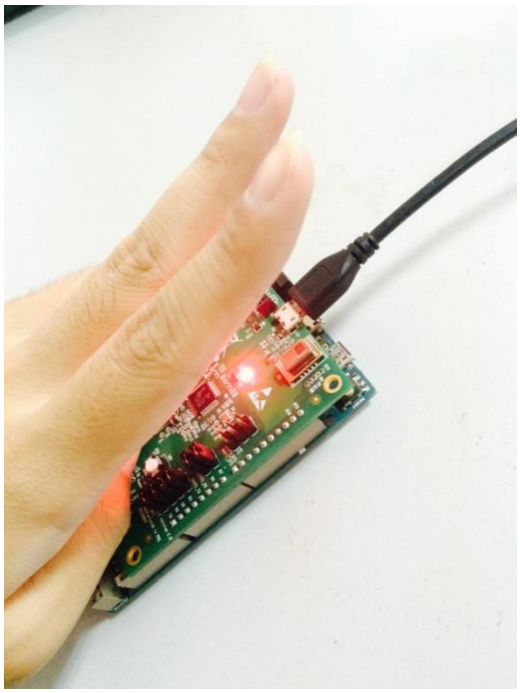
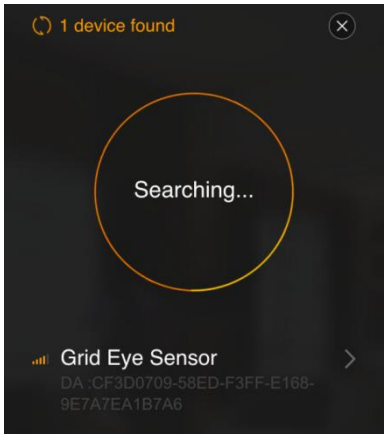



Image after interpolation and the original image:

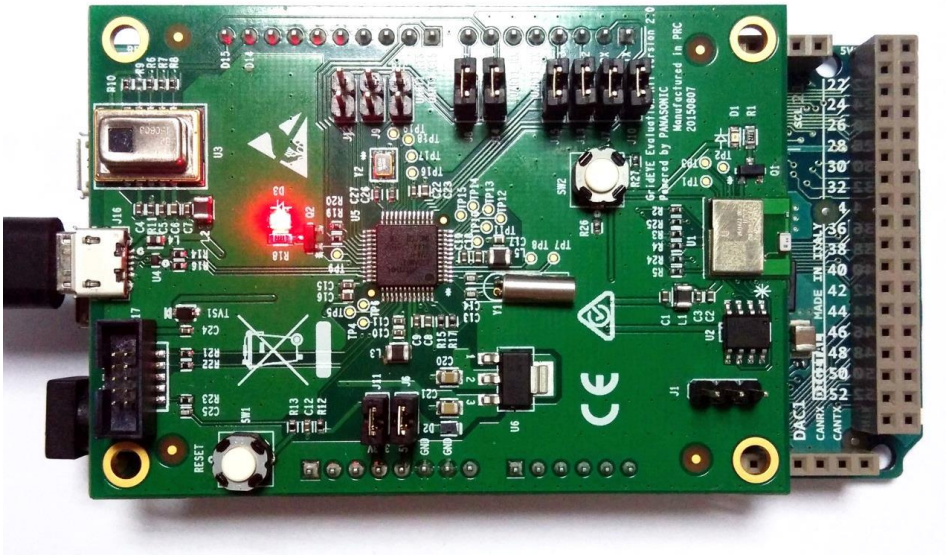
| | |
|---|---|
|  |  |
| Image after smoothing | Original image |

5) Open the DSPS / Panasonic ‘app’ on the smartphone and connect with Grid-EYE sensor, view the data sent over Bluetooth.

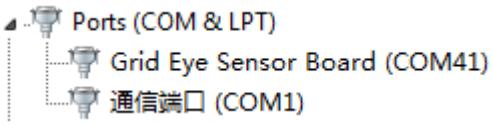


### 5.2.2 Arduino Mode Demonstration

1) Plug the Grid-EYE sensor board to Arduino mother board, set the jumpers, and connect the USB interface.

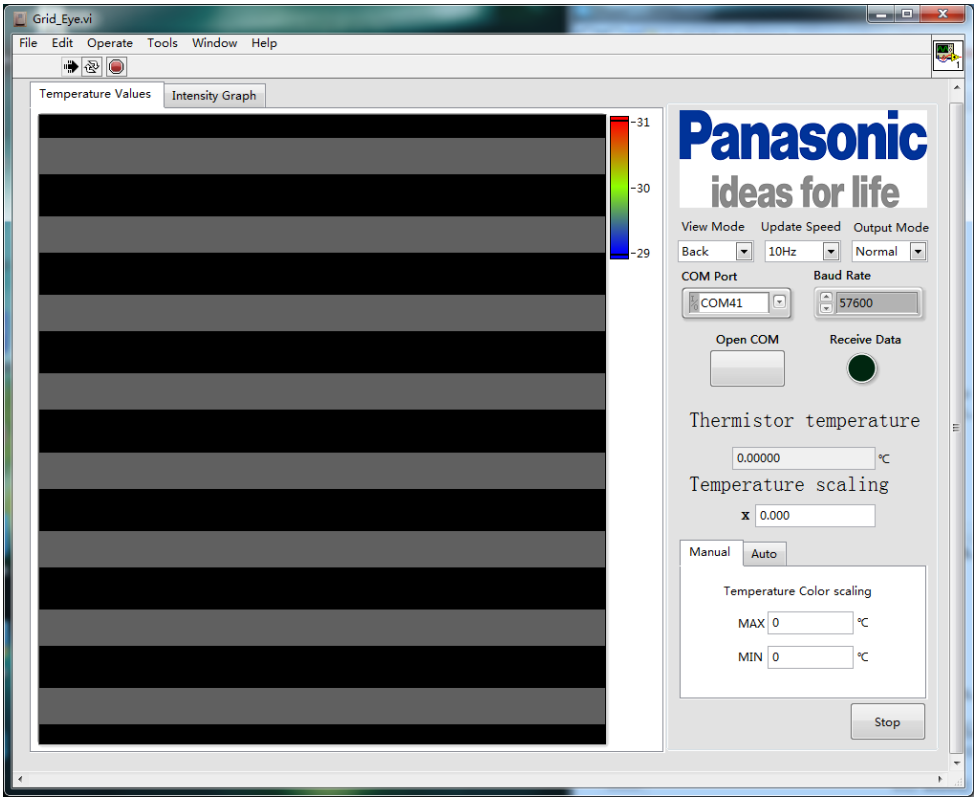


2) Open device manager to check the COM id for USB virtual COM.




.

3) Open PC software, select the corresponding COM port.




4) Open Com to view the output.

Temperature data detected:

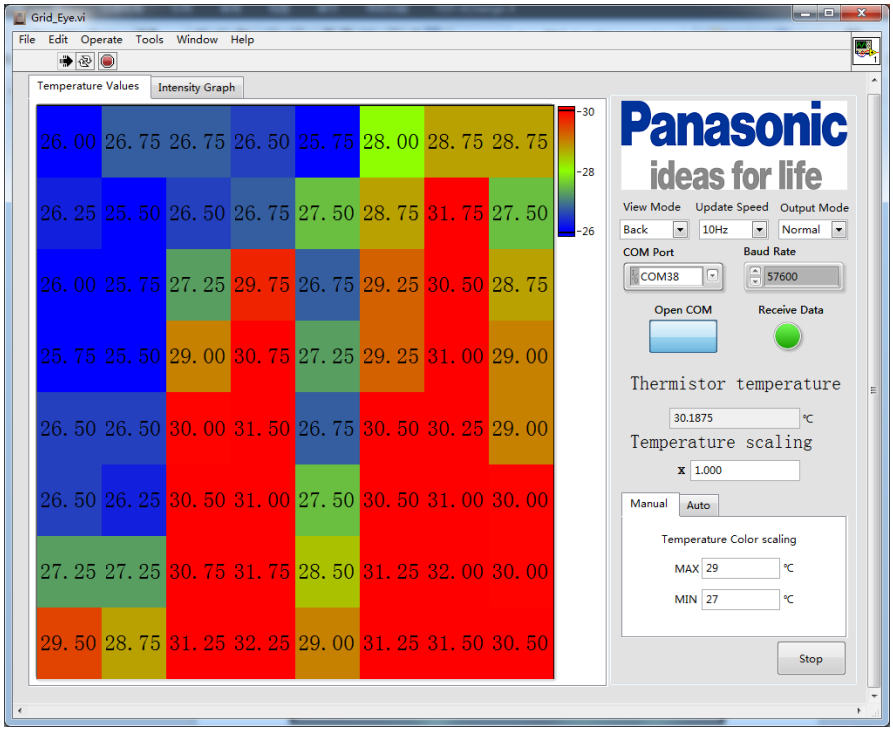
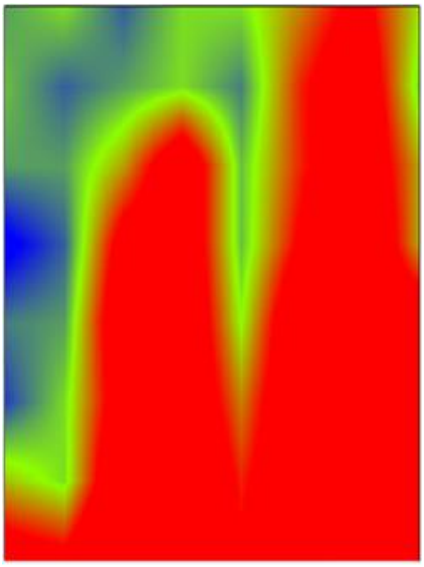
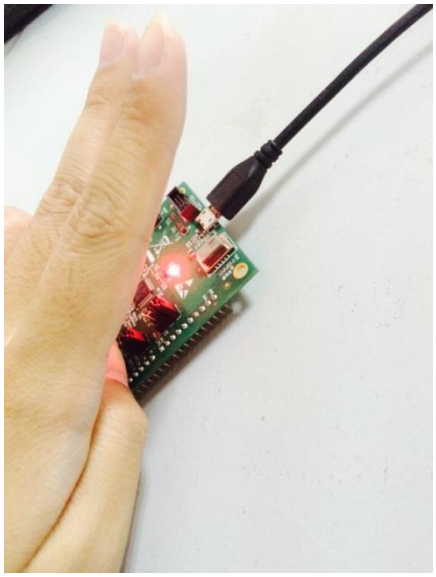


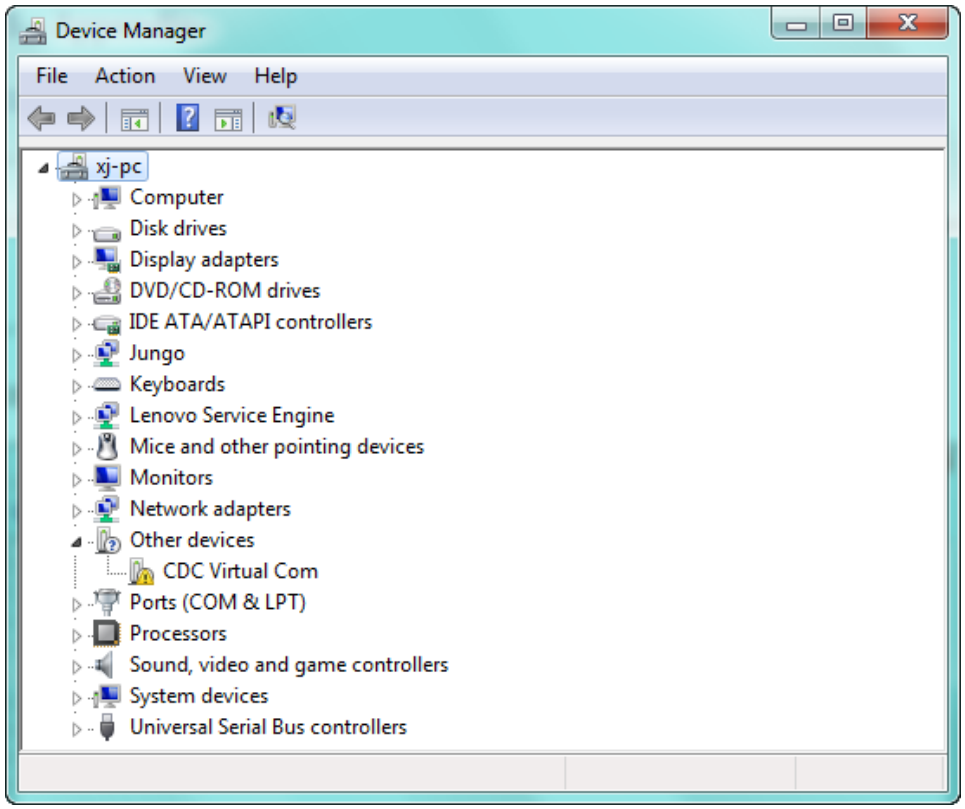
Image after interpolation and the original image:

| | |
|---|---|
|  |  |
| Image after interpolation | Original image |

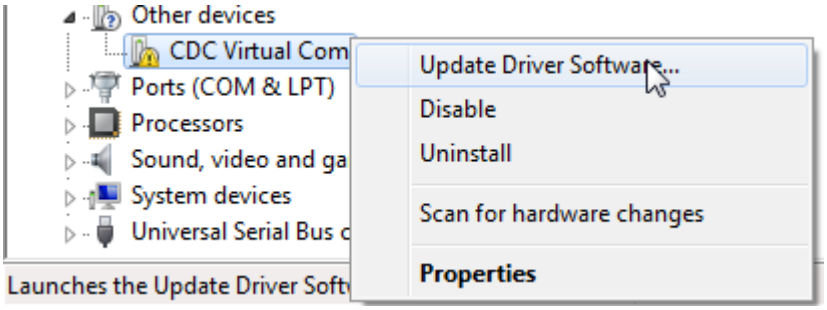
5) Open the DSPS /Panasonic ‘app’ on the smartphone and connect with Grid-EYE sensor, view the data sent over Bluetooth.

# 6 Appendix

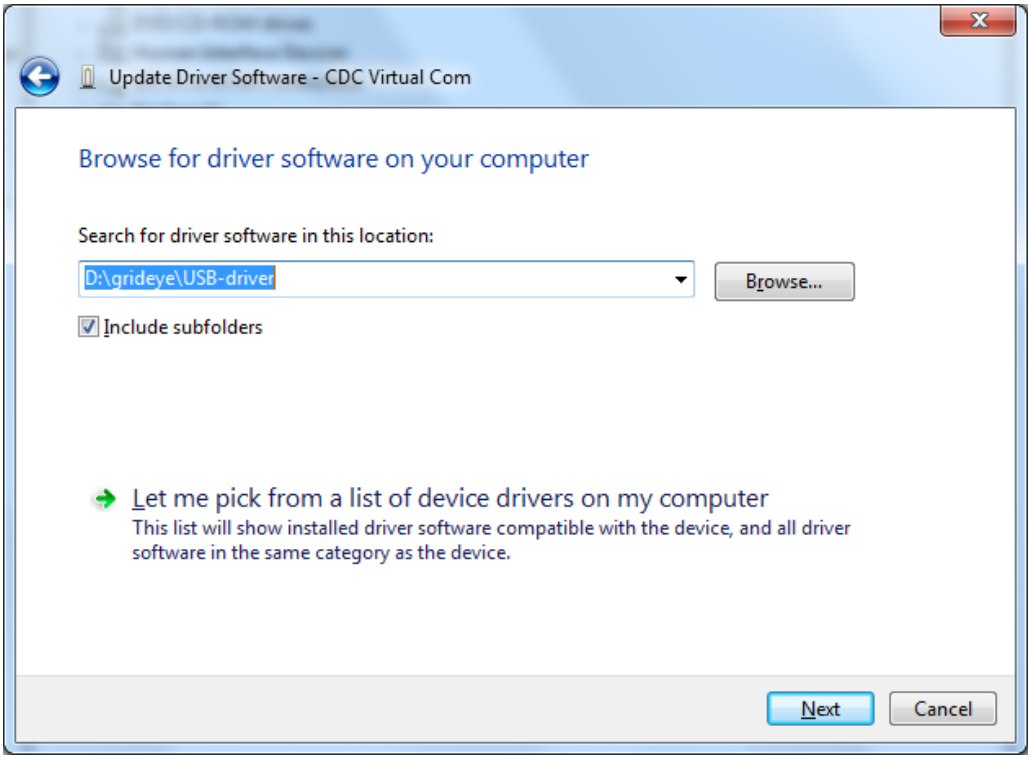
## 6.1 Install USB Driver for ATSAMD21G18A



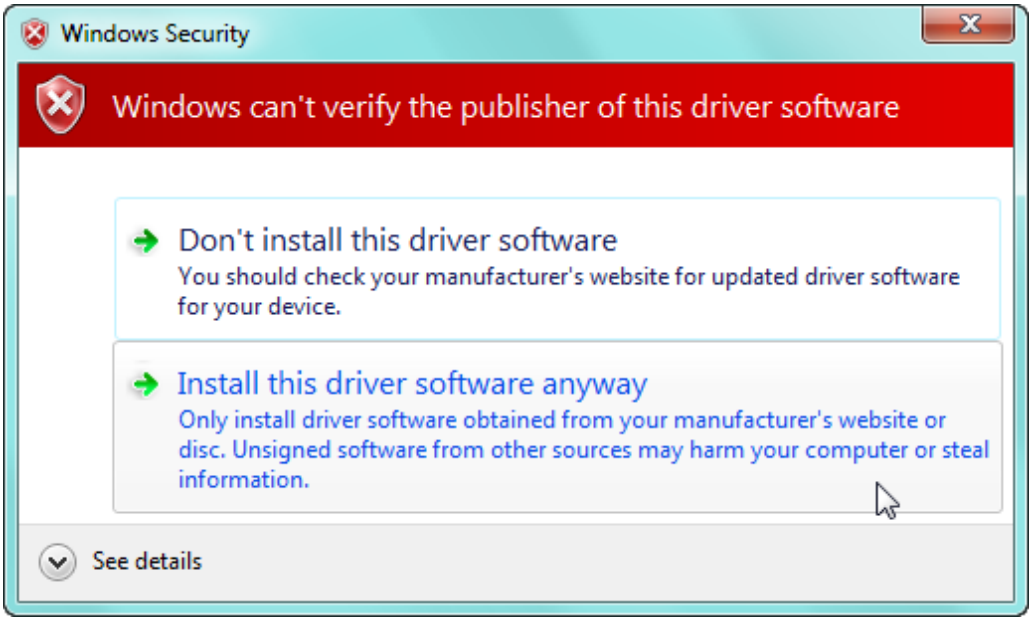

1) Open Device manager, if you haven't installed the USB Driver, you will find the "CDC Virtual Com" in "Other" devices tag with a yellow exclamation mark on it.



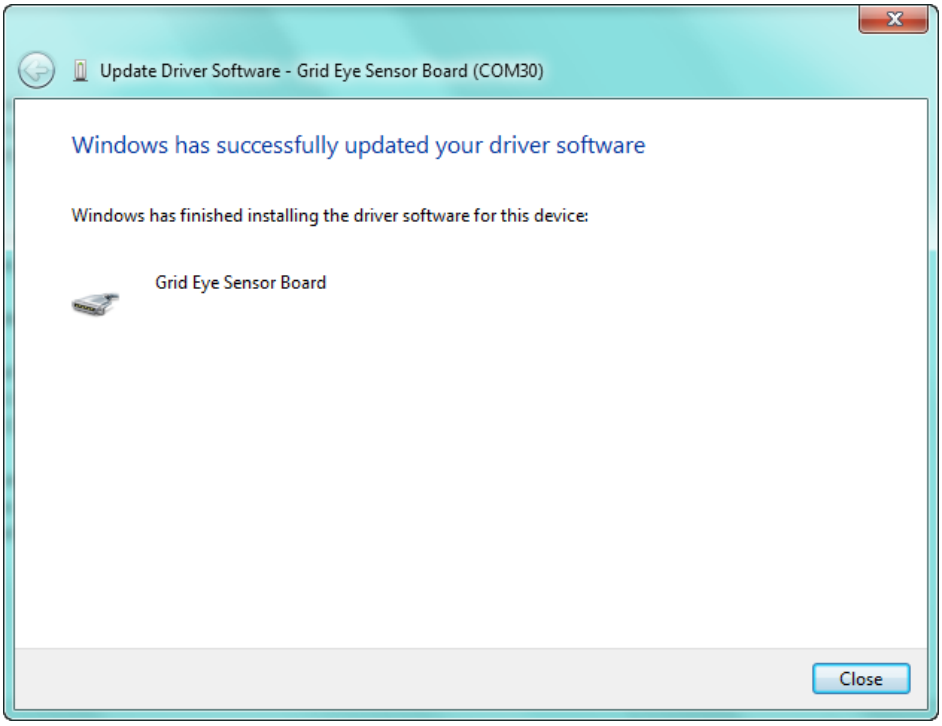
2) Right click the device name, then choose Update Driver Software supplied in the USB driver folder.



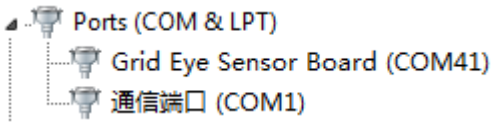

3) Choose “Browse my computer for driver software”, select the driver path.



4) Choose Install this driver software anyway, then wait for the complement of installation.




5) You will see the following after install is finished.



# 7 ESD precautions and proper handling procedures

This section includes the precautions for mechanical handling and static precautions to be taken to avoid ESD damage:

- Avoid carpets in cool, dry areas. Leave development kits in their anti-static packaging until ready to be installed.
- Dissipate static electricity before handling any system components (development kits) by touching a grounded metal object, such as the system unit unpainted metal chassis.
- If possible, use antistatic devices, such as wrist straps and floor mats.
- Always hold an evaluation board by its edges. Avoid touching the contacts and components on the board.
- Take care when connecting or disconnecting cables. A damaged cable can cause a short in the electrical circuit.
- Prevent damage to the connectors by aligning connector pins before you connect the cable. Misaligned connector pins can cause damage to system components at power-on.
- When disconnecting a cable, always pull on the cable connector or strain-relief loop, not on the cable itself.

# 8 Compliance Information

**CAN ICES-3 (B)/NMB-3(B) | Contains FCC ID: T7V1740 | Contains IC: 216Q-1740**

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.

Note: 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 or more 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