M13-RA6M3-EK

RA6M3 (Cortex-M4)
m13_ra6m3_ek_cam_lcd_streaming

Application Note Guide

TABLE OF CONTENT

1   INTRODUCTION

This application guide describes how to install the needed development tools/software, download the needed project, load it into the software environment and debug it with the M13-RA6M3-EK evaluation kit. The demo project **m13_ra6m3_ek_cam_lcd_streaming_demo** show you how to use and initialize a camera module with the evaluation kit.

1.1   PROJECT BRIEF DESCRIPTION

The project will demonstrate you how the configure a camera module and use it to live stream a video on the board's LCD screen. The following table shows you also which hardware feature of the board are being used in this demo.

Table 1. M13-RA6M3-EK Feature used

32Mbyte external SDRAM	✔
16Kbit I²C EEPROM	
4.3-inch 480x272 TFT LCD with capacitive touch panel	✔
USB Interface	
LAN Interface	
SD/MMC Host Interface	
I2S Audio codec	
3-Axis accelerometer	
On-board JLINK-OB debugger with VCOM	✔
8bit camera	✔
Mikrobus	
PMOD	
Mono-turn 10KΩ Potentiometer	
User led	✔
User switches and 1 x Reset switch	✔

2   REQUIRED RESOURCES

2.1   DEVELOPMENT TOOLS AND SOFTWARE

- IDE: e2studio 2021-01 or greater
- Tool Chain: GNU ARM Embedded Toolchain 9-2019-q4-major or greater
- Renesas Flexible Software Package (FSP) V3.1.0
- Serial Terminal (Free Serial Port Terminal, PuTTY)

2.2   HARDWARE

- M13design M13-RA6M3-EK Evaluation Kit
  https://www.m13design.fr/products/M13-RA6M3-EK.html

- USB cable: Micro-B male to USB-A male

- 8 Bit camera (Not included in the Kit)

Table 2. Supported camera modules

CMOS sensor	Camera modules	Output format	Parallel Interface
OV7740	24-pin OEM	YUV422	8-Bit
OV7670	16-pin Arducam[1]	YUV422 / RGB565	8-Bit
OV7670	18-pin OEM module[1]	YUV422 / RGB565	8-Bit
OV7670	24-pin OEM[1]	YUV422 / RGB565	8-Bit

1. A custom board is required to connect each of these camera modules to the board through CN9

2.3   RELATED DOCUMENTS

- Getting Started Guide for e2studio for RA
  https://www.renesas.com/us/en/document/man/getting-started-guide-e2-studio-ra?language=en&r=488826

- Renesas Flexible Software Package (FSP) v2.3.0 User's Manual
  https://www.renesas.com/us/en/document/mas/renesas-flexible-software-package-fsp-v310-users-manual?language=en&r=658306

- Renesas RA6M3 Group User's Manual
  https://www.renesas.com/eu/en/document/man/ra6m3-microcontroller-group-users-manual?language=en&r=1054166

- M13-RA6M3-EK schematic
  https://www.m13design.fr/download/pdf/M13design_M13-RA6M3-EK_SCH_V1.0_2021.03.02.1.pdf

- M13-RA6M3-EK User manual
  https://www.m13design.fr/download/pdf/M13design_M13-RA6M3-EK_UM_V1.0.1_2021.03.03.1.pdf

3   DOWNLOAD AND INSTALLATION

3.1   E²STUDIO

The e2studio IDE is downloadable here https://www.renesas.com/us/en/software-tool/e-studio

Make sure to have Renesas account or create one before downloading

Refer to the "Getting Started Guide for e2studio for RA" section 2 for a compete installation guide.

3.2   PROJECT DEMO

You can find the **cam_lcd_streaming** project for the M13-RA6M3-EK board for download here:
https://www.m13design.fr/download/software/m13_ra6m3_ek_cam_lcd_streaming_demo.zip

3.3   SERIAL TERMINAL CONFIGURATION

Make sure to launch your Serial Terminal client with the following configuration:

- Baud Rate: 115200
- Data Bits: 8
- Parity: None
- Stop Bits: 1
- Flow Control: None
- COM Port: As detected in your Windows^{TM} Device Manager

4   IMPORTING THE DEMO PROJECT

4.1   STEP1: LAUNCH E²STUDIO

Assuming you have e²studio installed, launch the software and enter a workspace location as shown in Figure 1 below than click "**launch**" and wait until the environment is fully loaded.

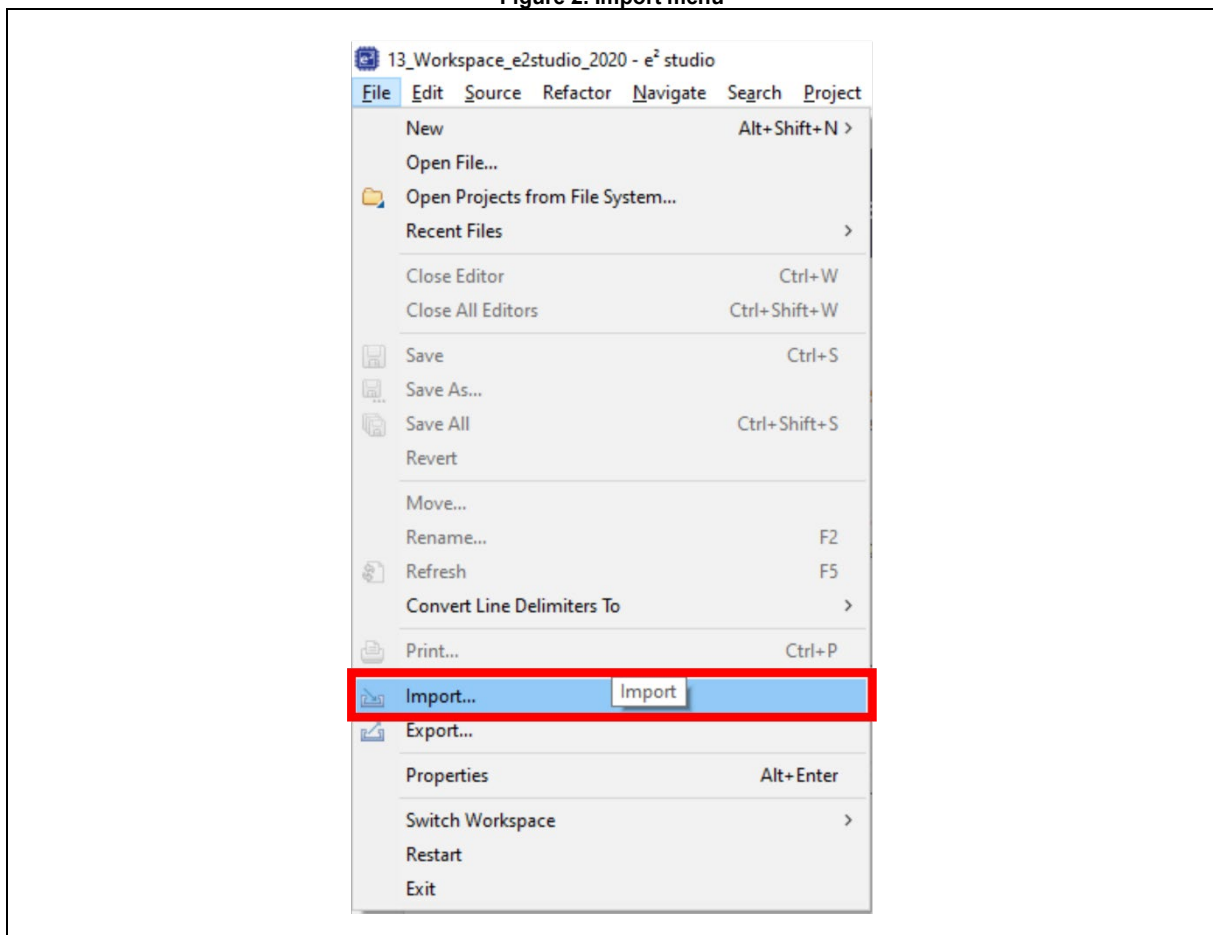**Figure 1. Workspace location**
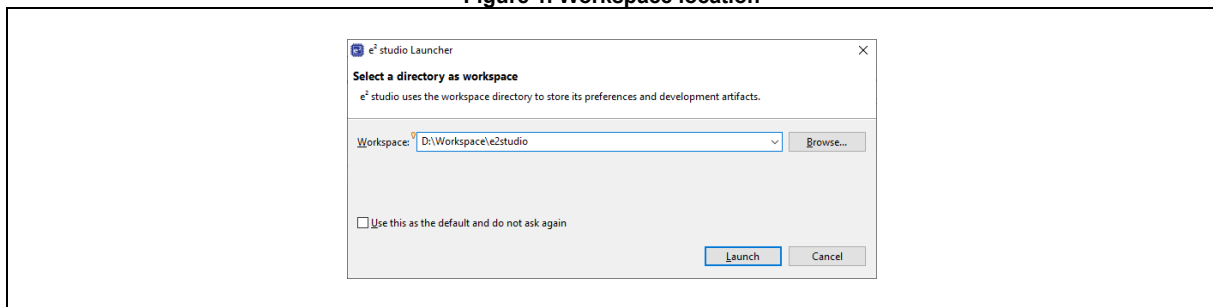
4.2   STEP2: FILE/IMPORT

To import the previously downloaded project, in the top menu, click on "**File**" and choose the "**import**" option in the dropdown menu as shown in the Figure 2 below.
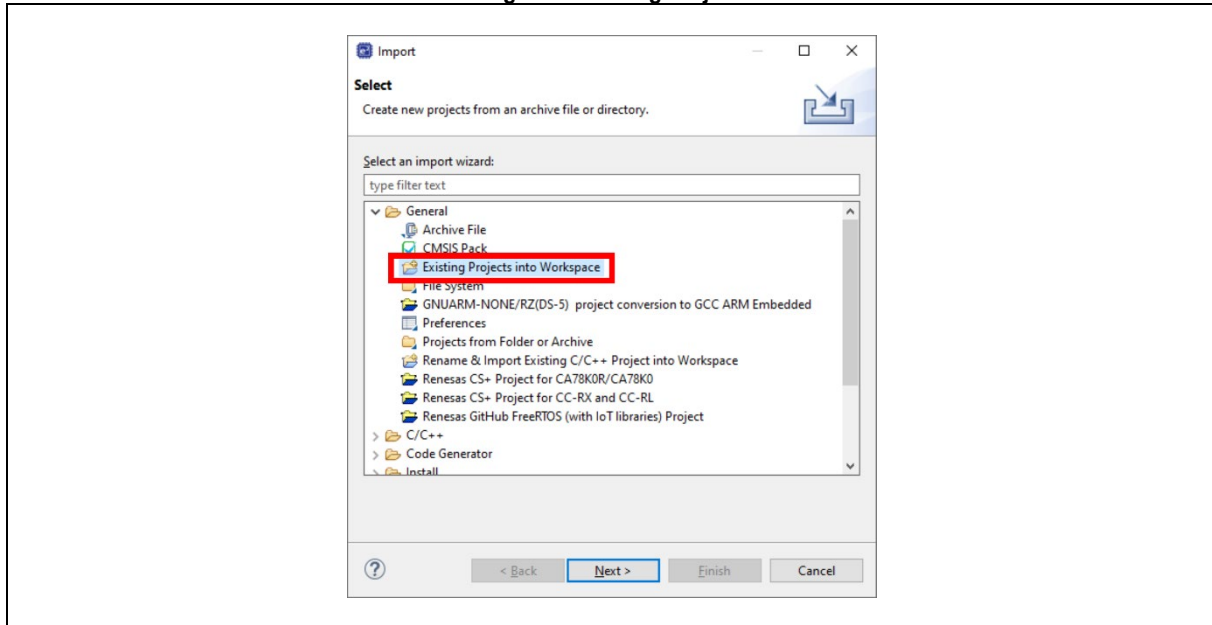
Figure 2. Import menu

4.3 STEP3: EXISTING PROJECT

From the "**Import**" popup box, select in the "**General**" file section the option "**Existing Projects into Workspace**" and click "Next"

Figure 3. Existing Project

4.4   STEP4: PROJECT LOCATION

In the next box, select your project location by clicking on the "**Browse**" button on the right side as shown in Figure 4. If preferred, you can import an archived project instead by checking the "**Select Archive file**" mark. In both cases, make sure the project is checked in the "**Project**" area. Any other options can be left unmarked and click the "**Finish**" button down below.
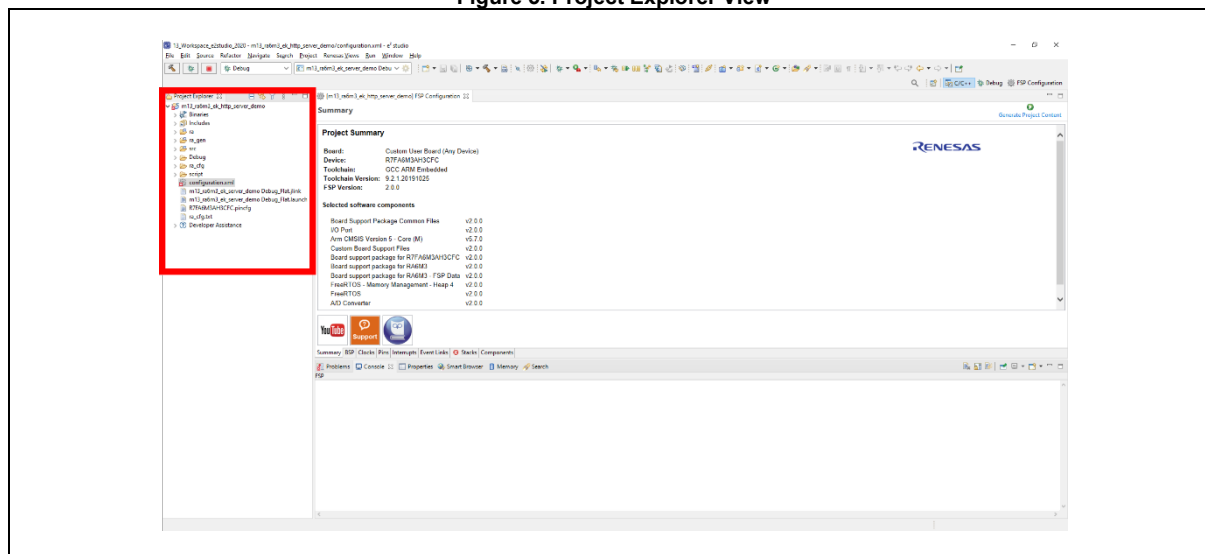
Figure 4. Select root directory
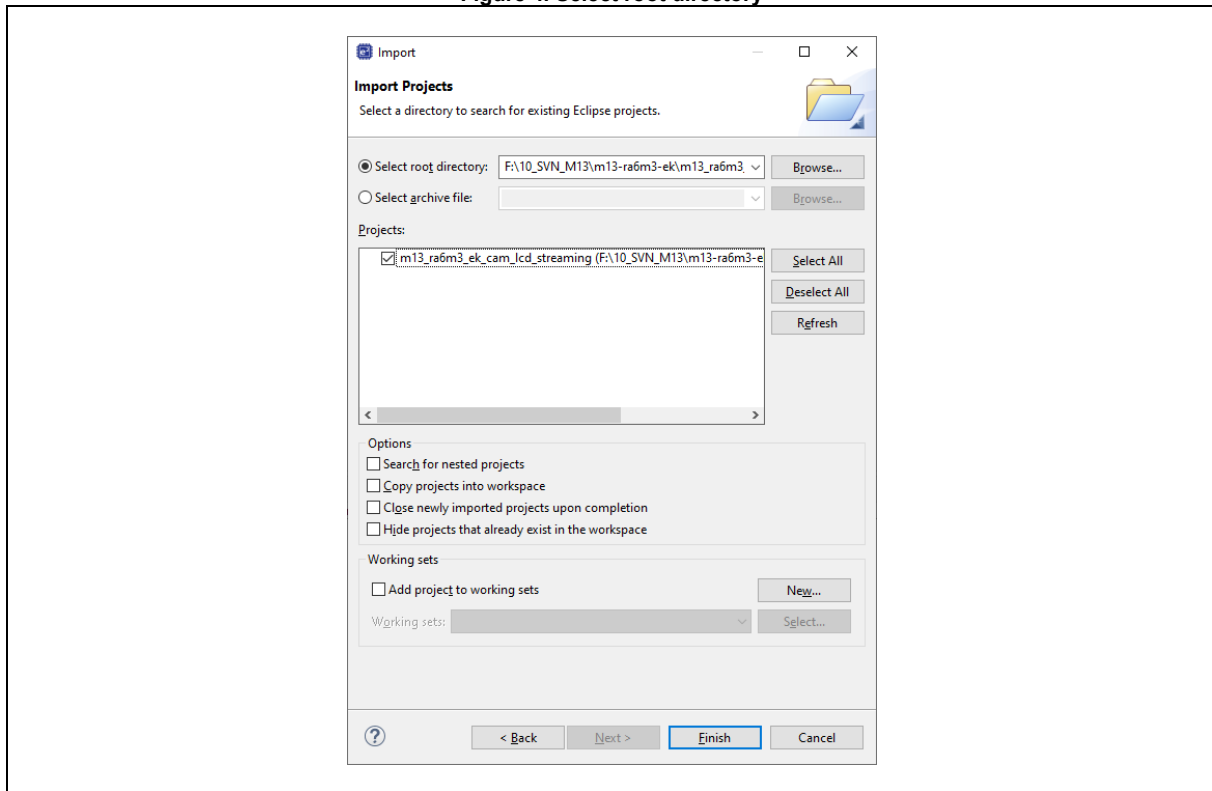
4.5 STEP5: PROJECT EXPLORER VIEW

Close the "**Welcome**" page if you haven't done it yet and you should see your newly imported project on the left side "**Project Explorer view**" as shown in Figure 5.

**Figure 5. Project Explorer View**

5 GENERATE, BUILD AND DEBUG

5.1 STEP1: FSP INTERFACE

Before building the project, you need to generate the missing project files (APIs and such) from the FSP interface. In order to do so, from the "Project Explorer view", click on "configuration.xml" as pointed by the green arrow in the below figure. (If the FSP does not open correctly, this time right click on "configuration.xml" and go to **Open with > FSP Configuration Editor**). The FSP window should appear as shown in Figure 6.

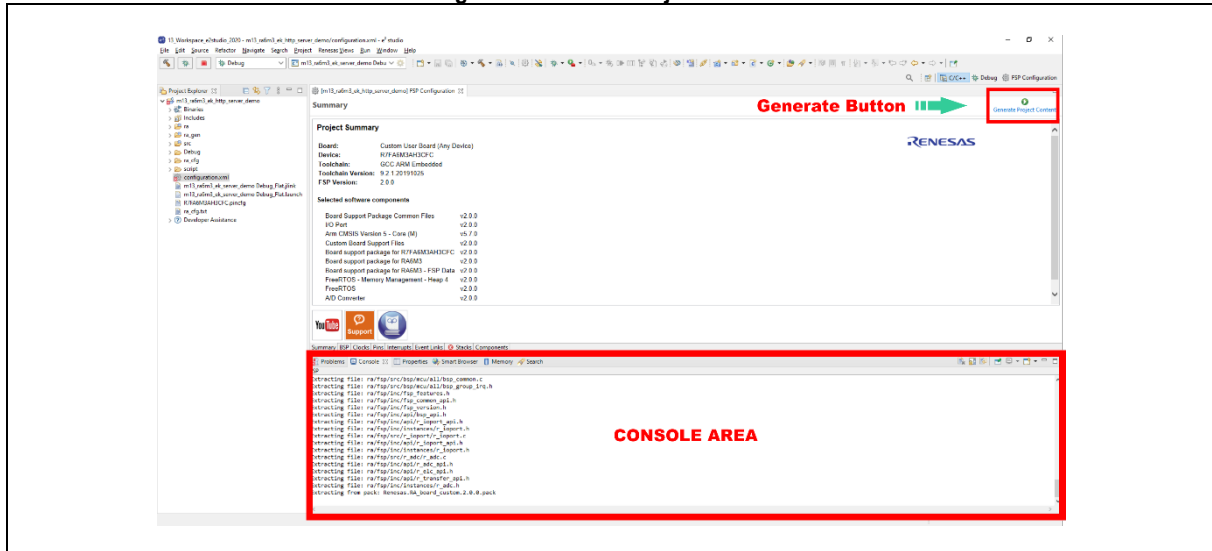**Figure 6. FSP View**
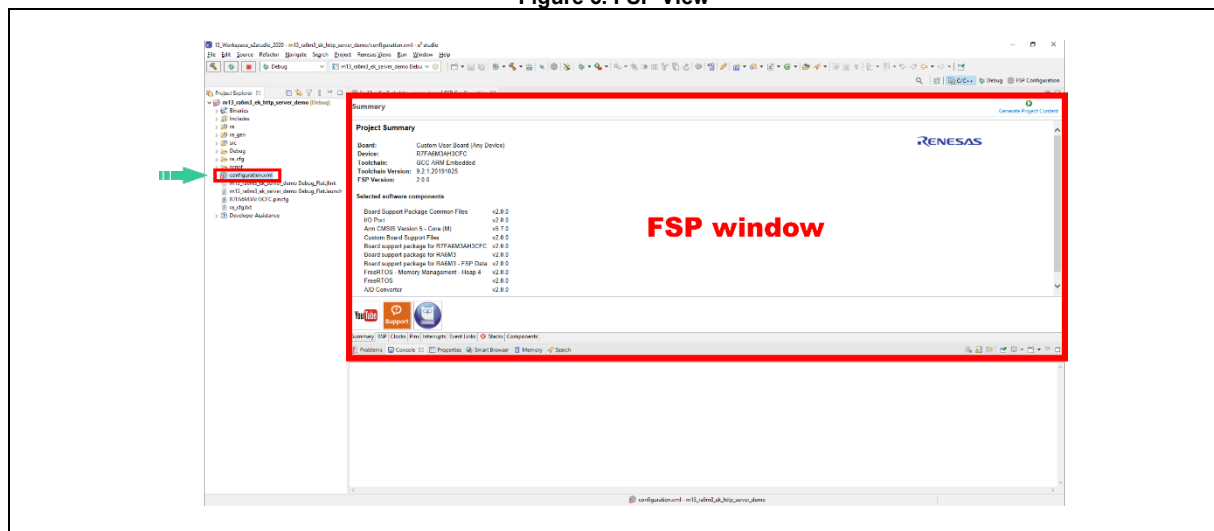
5.2   STEP2: GENERATE

Make sure the "Console Tab" is activated in the bottom view then in the top right corner on the FSP window section click on the "Generate Project Content" button. The generated files should output in the "Console view/area" as they are generated.

Figure 7. Generate Project Content

5.3   STEP3: BUILD

From here on we can build the project. If you have more than one project in your workspace, make sure to select the project to be built in the "Project Explorer view" then click on the "Build" Icon in the top menu as shown in Figure 8. The build result should output "*Build Finished. 0 errors, 0 warnings*" in the "Console view".

Figure 8. Build button
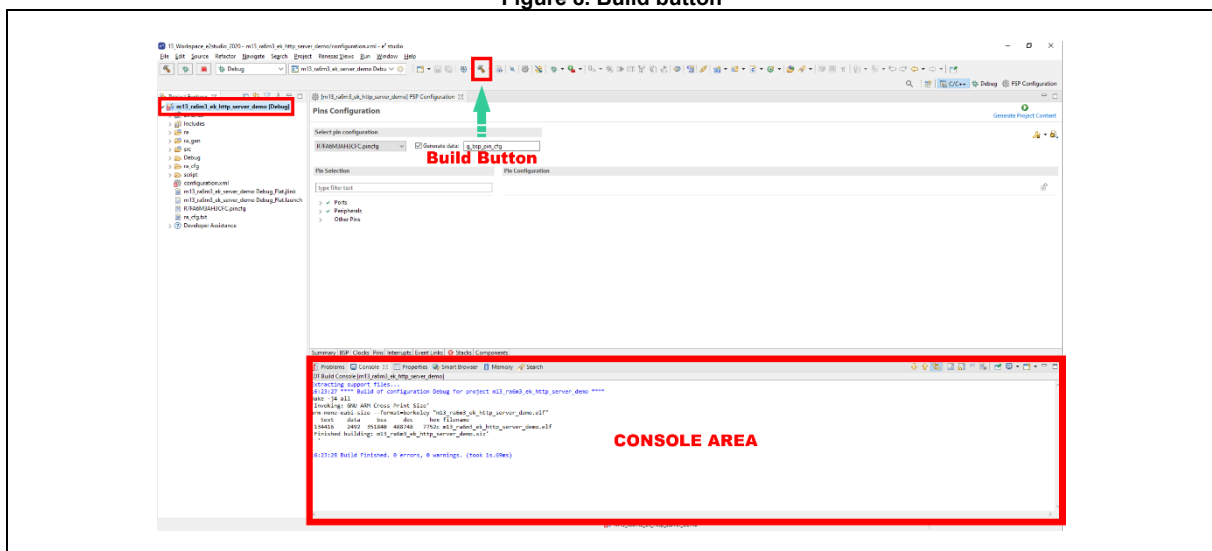
5.4   STEP4: DEBUG

Before launching the debug session, make sure the M13-RA6M3-EK board is connected to your computer via the USB connector CN5 as shown in Figure 9. Click on the "**Bug**" Icon as shown in below Figure 10 to launch the debug session. Also, make sure the camera is connected on the board as shown in section 6.2.
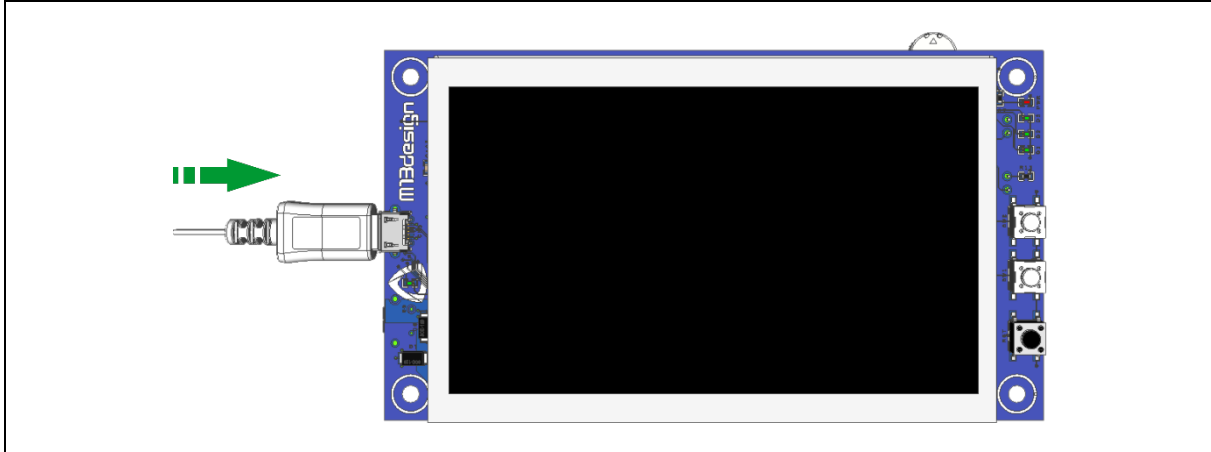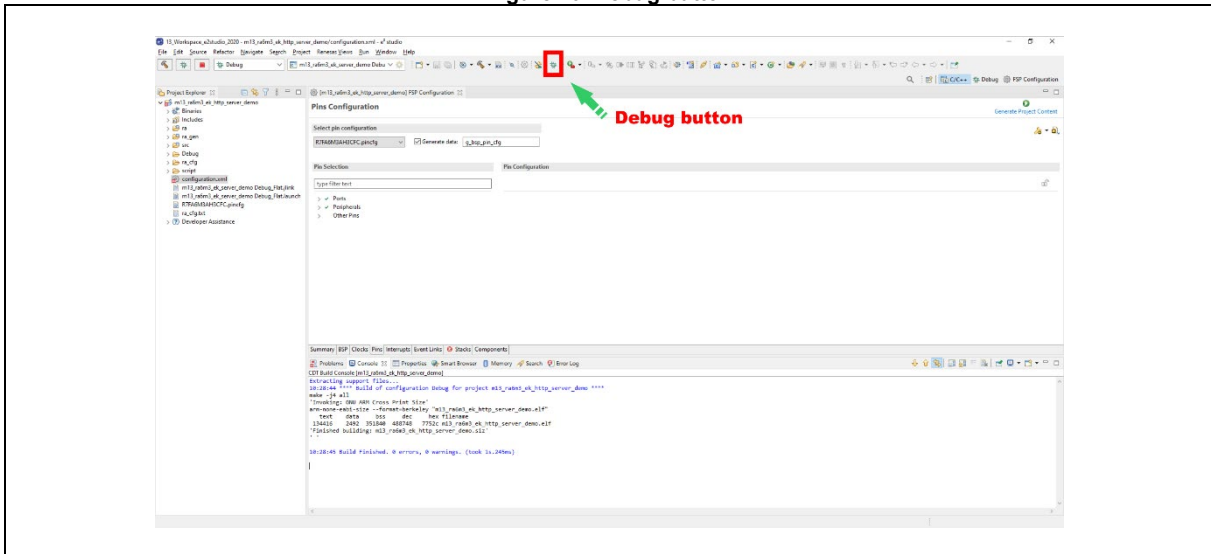
Figure 9. Connecting the board to the computer

Figure 10. Debug button

5.5　　STEP5: START

Before starting the debug, make sure your serial terminal client is activated and configured as described in section 3.3 Serial Terminal configuration in order to see the demo debug messages. As shown in Figure 11, your starting point should be in the Reset Handler. A fist click on the "**Resume**" button (**Shortcut F8**) should take you to the main function. A second click on the "**Resume**" button should start the demo for good.
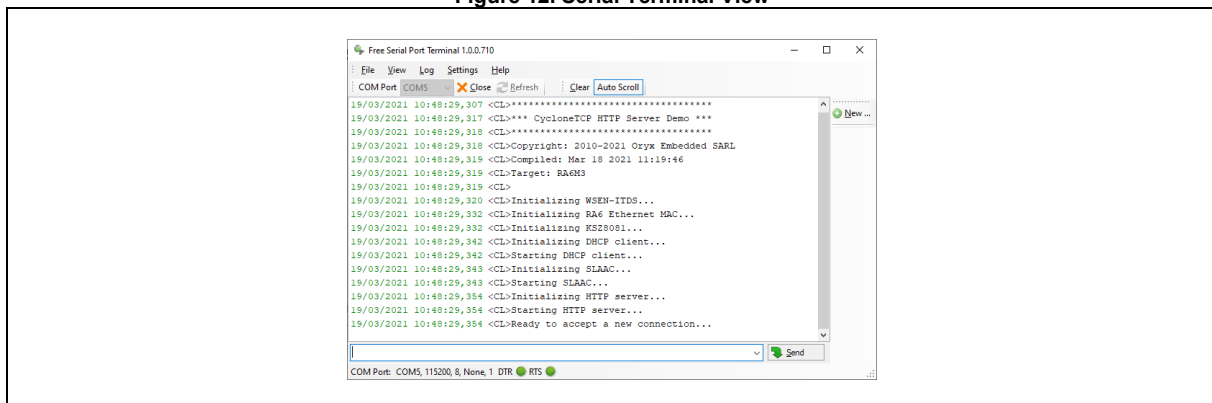
Figure 11. Start in Reset Handler
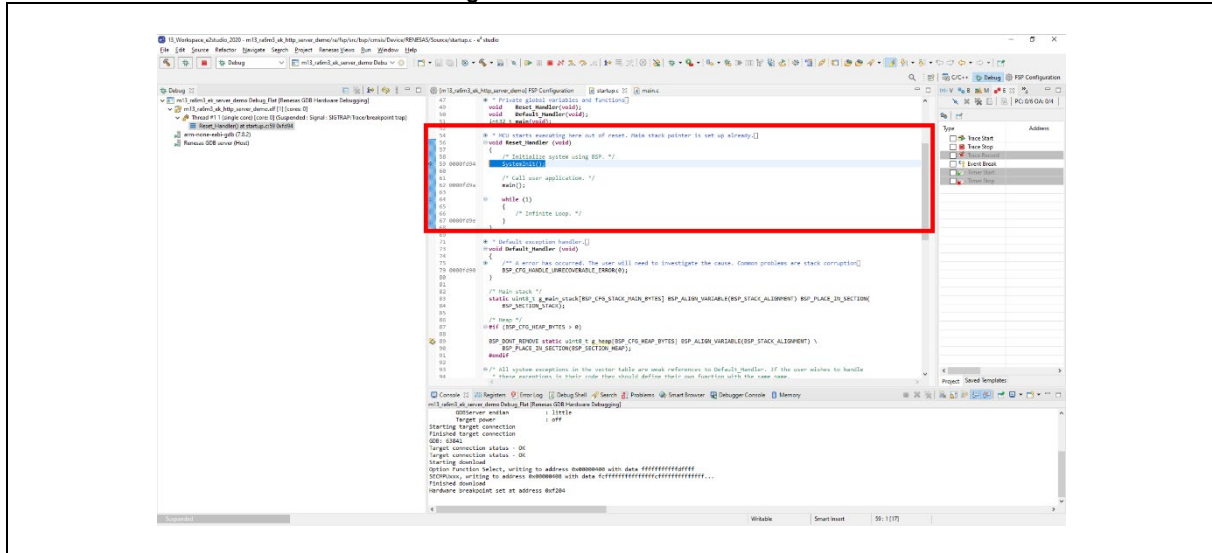
Here are the things to look out for to make sure the demo is running without any issues:

- Make sure your Serial Terminal is outputting debug messages

Figure 12. Serial Terminal View

- Make sure your board's D2 Led is blinking

6   MANIPULATING THE DEMO

6.1   SOFTWARE CONFIGURATION

For this demo, the camera configuration can be done in the *m13_ra6m3_ek_config.h* file which can be found in the *<project_location>/m13design/* folder.

The camera configurations currently supported by the project is shown in Table 3 below.

Table 3. Camera sensor configurable options

Options	OV7740 sensor	OV7670 sensor
YUV colour mode	✔	✔
RGB565 colour mode	-	✔
VGA (640x480) resolution[1]	-	-
QVGA (320x240) resolution	✔	✔
QQVGA (160x120) resolution[2]	-	✔
Customizable resolution[2]	-	✔

1. VGA resolution is not tested on the board as it will not fit on the screen but both sensors are capable of outputting VGA.
2. QQVGA and Customizable resolution were not tested with the OV7740 sensor.

Only 2 sensors were tested on the board. For any other sensor compatibility requests on the board contact our sales and/or support team (sales@m13design.fr / support@m13design.fr)

6.2   CONNECTING THE CAMERA

Compatible cameras can be connected on CN9 as shown below on Figure 13 and Figure 14 and must be done before connecting the USB cable to power supply the board.

6.2.1   OV7740 SENSOR MODULE

OV7740 cameras can be connected directly on the back of the board on CN9 and facing toward the LCD side of the board.

Figure 13. OV7740 Camera module connection
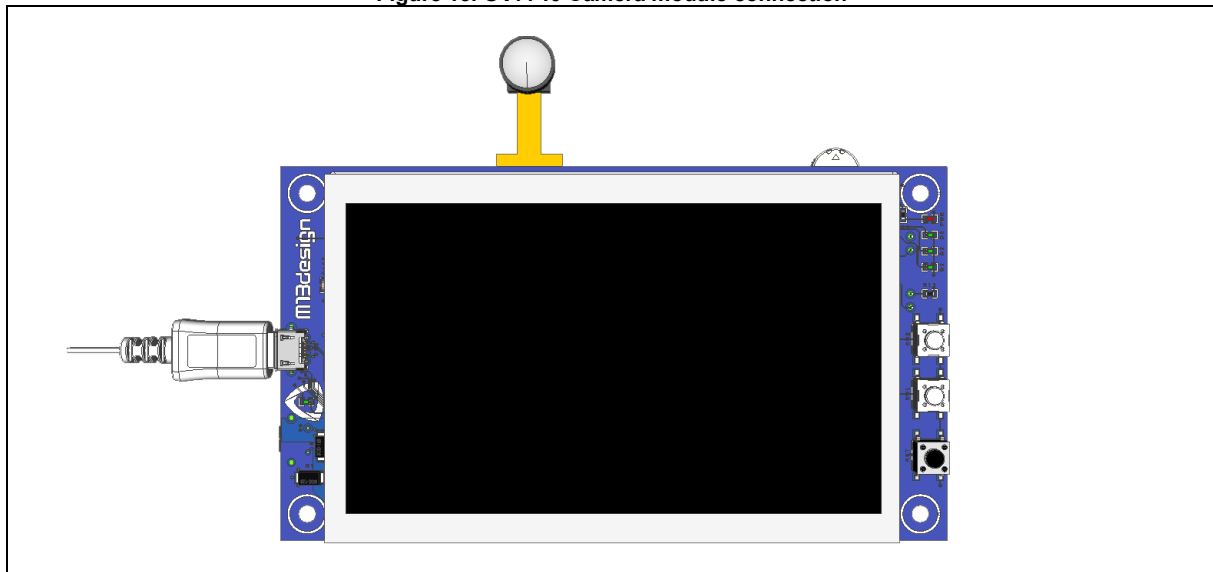
6.2.2   OV7670 SENSOR MODULE

OV7670 camera modules can be connected to the board through its CN9 connector and using an adapter board as shown in Figure 14 below. Contact our sales and/or support team (sales@m13design.fr / support@m13design.fr) for more information on the adapter board for this camera sensor.

Figure 14. OV7670 Camera module connection
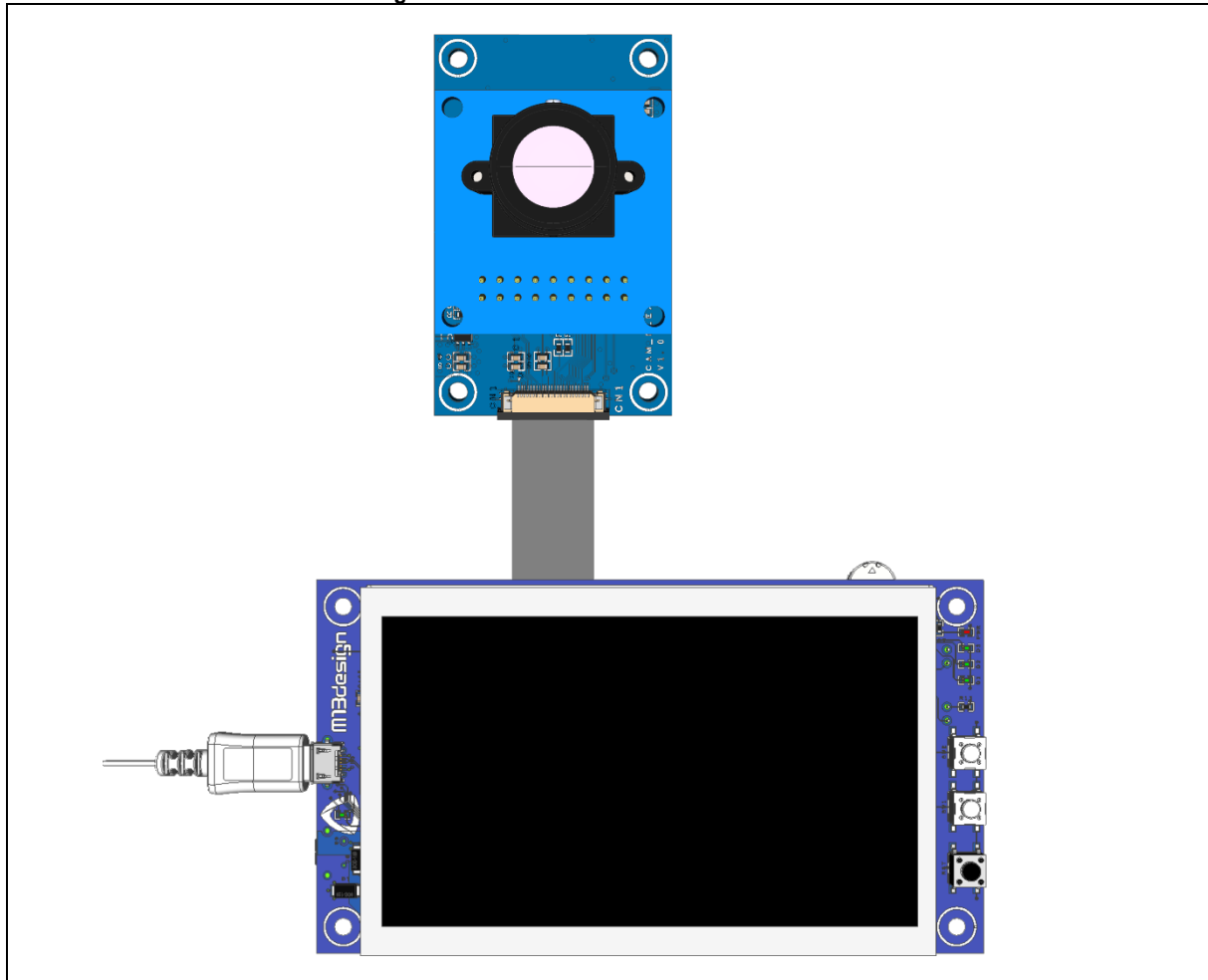
6.3   CAMERA FEED DISPLAYED ON THE LCD SCREEN

Figure 15. Output display
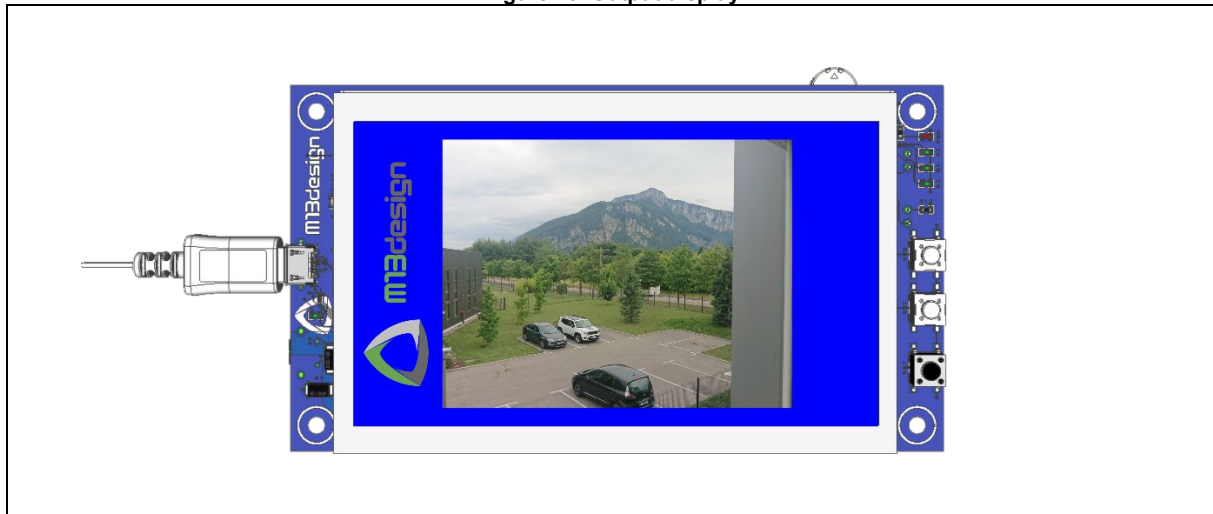
When starting the debug session, the camera feed will start displaying immediately on the screen as shown in Figure 15 and the frame rate is sent out on the board's UART which can be displayed via any Serial Port Terminal client such as PuTTY.

7   CONTACT AND SUPPORT

7.1   GENERAL CONTACT

For any general inquiries, fill-in our online contact form here: https://www.m13design.fr/contact/

Or send us a request by email at: sales@m13design.fr

7.2   SUPPORT CONTACT

For any technical support and/or request, contact us via email at: support@m13design.fr

8   REVISION HISTORY

Table 4. Revision Table

Revision	Date	Revision content
V1.0.0	13-Jul-22	Initial release.
V1.0.1	6-Sep-22	- Updated Table 2 CMOS sensor list - Added Section 6.1 Software configuration - Added section 6.2.1 and section 6.2.2

Disclaimer

Headquarters

M13DESIGN
165, rue Louis Barran
ZA Centr'Alp 2
38430 Saint-Jean-De- Moirans – France

//www.m13design.fr/

Contact information

For further information on a product, technology, the most up-to-date version of a document, or your nearest sales office, please visit or product web page:

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