



Riverdi STM32 Evaluation Board

User Manual

Rev.1.8
2022-11-14

The STM32 Evaluation Board is developed to evaluate below products:

- [Riverdi intelligent displays with BT817Q\(EVE4\) controller](#)
- [Riverdi High brightness, IPS, displays](#)



REVISION RECORD

REV NO.	REV DATE	CONTENTS	REMARKS
1.0	2020-08-17	Initial Release	
1.1	2020-11-06	CPU information updated	
1.2	2021-03-09	Pictures updated	
1.3	2021-03-31	Document adjusted into standard template	
1.4	2021-06-02	Corrections on description related to jumper P7, P8, P9	
1.5	2021-10-27	Updating new template Add user guide on how to evaluate Riverdi High Brightness, IPS series and Riverdi EVE4 series displays by the ready software developed by Riverdi	
1.6	2022-01-17	Update broken links	
1.7	2022-04-07	Specify the scope of applied product: Only support evaluating Riverdi EVE4 (BT817Q) Series and Riverdi High Brightness, IPS Series .	
1.8	2022-11-14	Update product photos on page 5,7,11	



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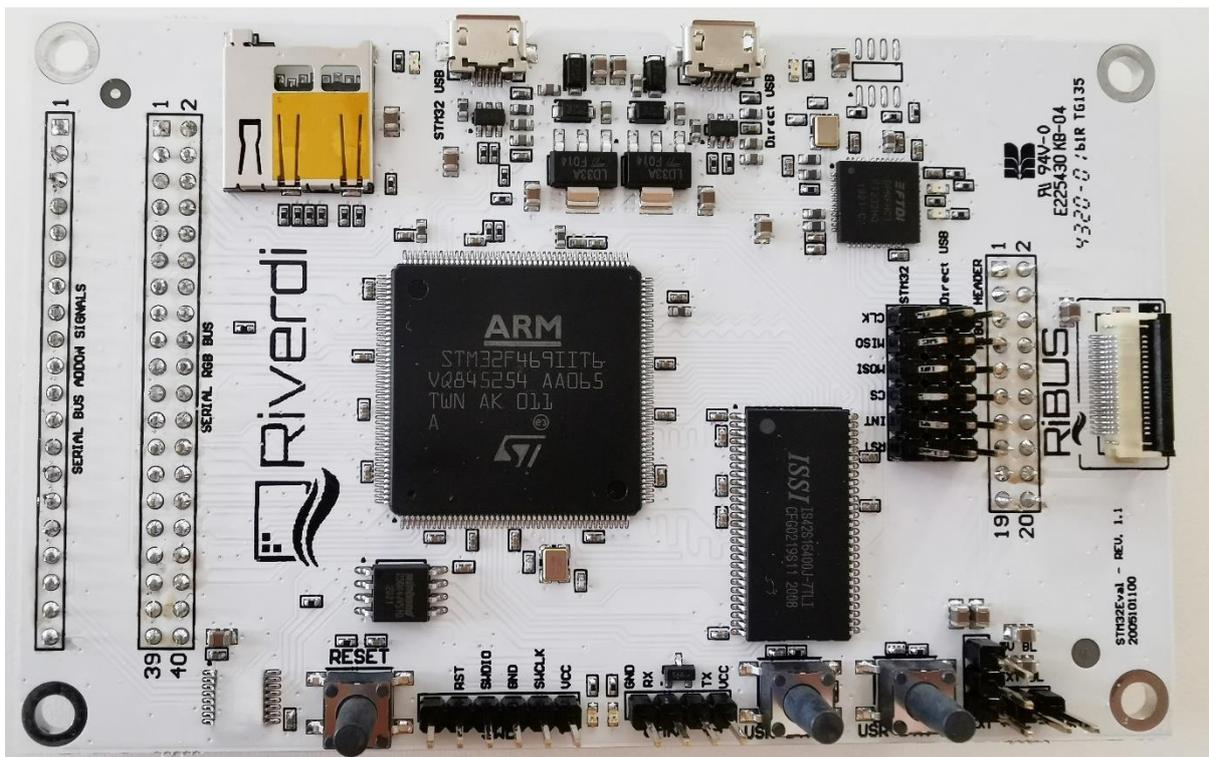
1. TARGET READERS

The aim of this document is to enable engineers using Riverdi STM32 Evaluation Board to get the tested Riverdi display running fast and easily. Further tests and development can be carried out shortly after Riverdi STM32 Evaluation Board is switched on for the first time.

2. PRODUCT FEATURE

The Riverdi STM32 Evaluation Board is designed as a complete demonstration and development platform for [Riverdi's EVE4](#) and [High Brightness, IPS](#) displays lines driver technology.

It features an STM32F469II Cortex-M4 microcontroller with: LCD parallel interface including 8080/6800 modes, an LCD-TFT controller, Chrom-ART Accelerator™ for enhanced graphic content creation (DMA2D), secure digital input/output interface (SDIO), LTDC signals available on header P11 with additional MCU pins broken out on P12, external SDRAM, MicroSD slot for data/media storage, RiBUS FFC conn P3 featuring SPI, UART and LCD supply pins (SPI can be controlled by either STM32 or UBS serial bridge via jumper on P7/8/9) and configurable display backlight supply (EXT/INT).



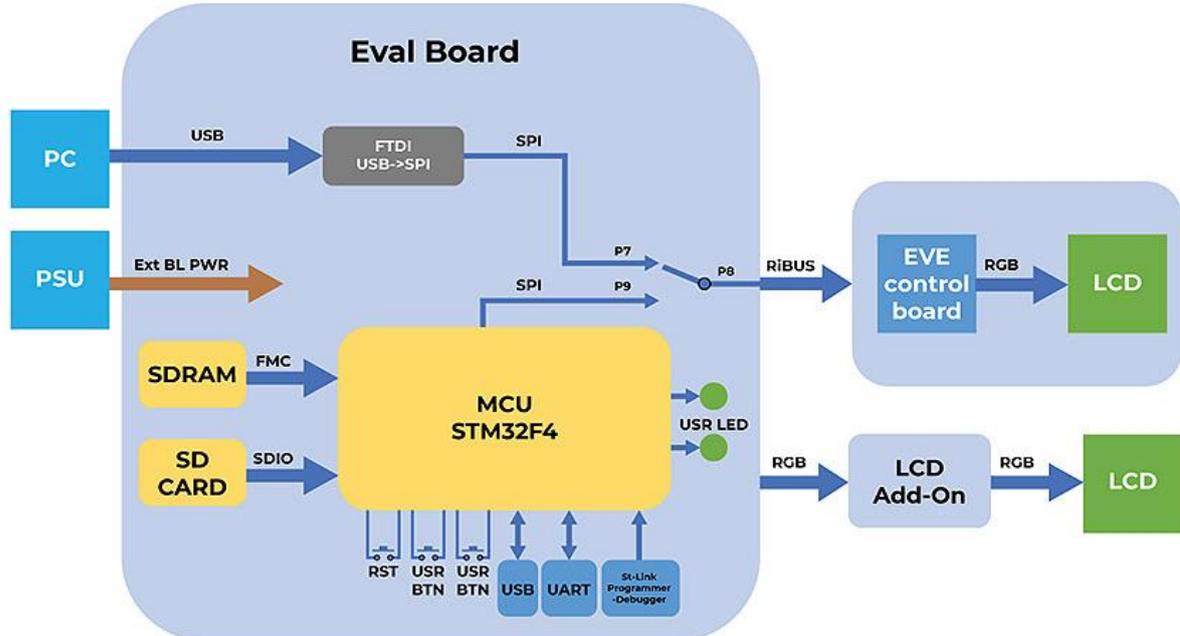


3. INTRODUCTION

Riverdi STM32 Evaluation Board is a tool designed to help get you started on working with Riverdi products. It's not only [EVE4 modules for displays from 3.5" through 10.1"](#) but also [High Brightness, IPS displays with RGB, LVDS, DSI interfaces](#) (the two last types must have additional serializer) in combination with touch panels by Riverdi.

You have three primary options to drive external displays:

1. Jumper between P7 & P8: FTDI serial/SPI bridge connected to RiBUS SPI:
Use the FT232 serial to SPI bridge by connecting a micro-USB cable to the connector labeled "Direct USB" and using the **EVE Screen Editor** to quickly generate graphical user interfaces with minimum effort.
2. Jumper between P9 & P8: STM32 connected to RiBUS SPI:
Use the on board STM32F4 to develop and test firmware for driving a connected display or display controller, like Riverdi EVE4 intelligent display.
3. Extension Addon Board
Use extension Addon board to drive Riverdi High Brightness, IPS display without EVE4 controller IC. An add-on board is the hardware interfacing device that provides the necessary connection between LCD itself and STM32 Evaluation Board. To make it possible to use many modules differing in size, signal connectors and mechanical builds, addon boards are customized to the displays they are serving.



4. BOARD FUNCTIONALITY TEST

There are firmware examples with which you can test your Riverdi STM32 Evaluation Board. You can also use those as a starting point for your own firmware development.

5. INTERFACING WITH EVE DISPLAYS

This chapter describes the procedures of using the application EVE Screen Editor (ESE) to create your own GUI application.

For quick start, Riverdi has prepared official, ready-to-use demonstration software which is preloaded in the STM32 Flash memory for easy demonstration of the Riverdi EVE4 series displays. Please refer to [Chapter 6](#) for more details.

5.1 Using the FTDI SPI Bridge & EVE Editor

Prerequisites:

- Riverdi STM32 Evaluation Board
- EVE-enabled display
- RiBUS flexible flat cable (FFC)

5.2 EVE Screen Editor Installation

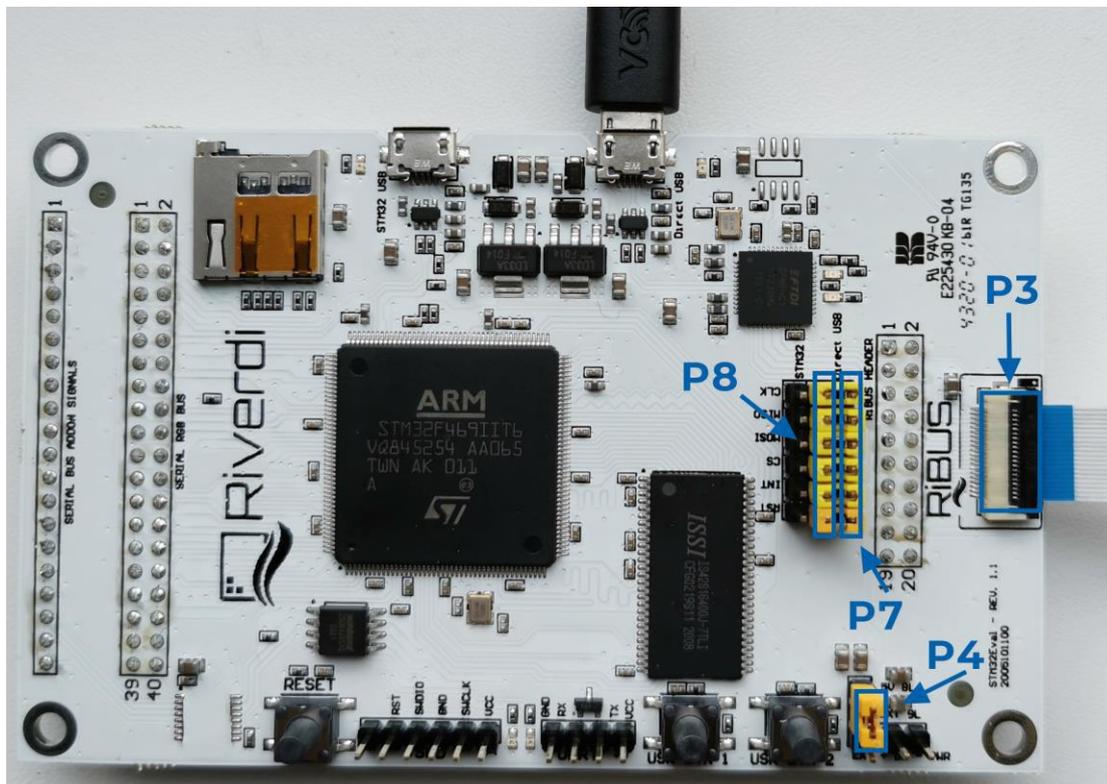
Download and install the EVE Screen Editor from below link:

<https://brtchip.com/ic-module/toolchains/>

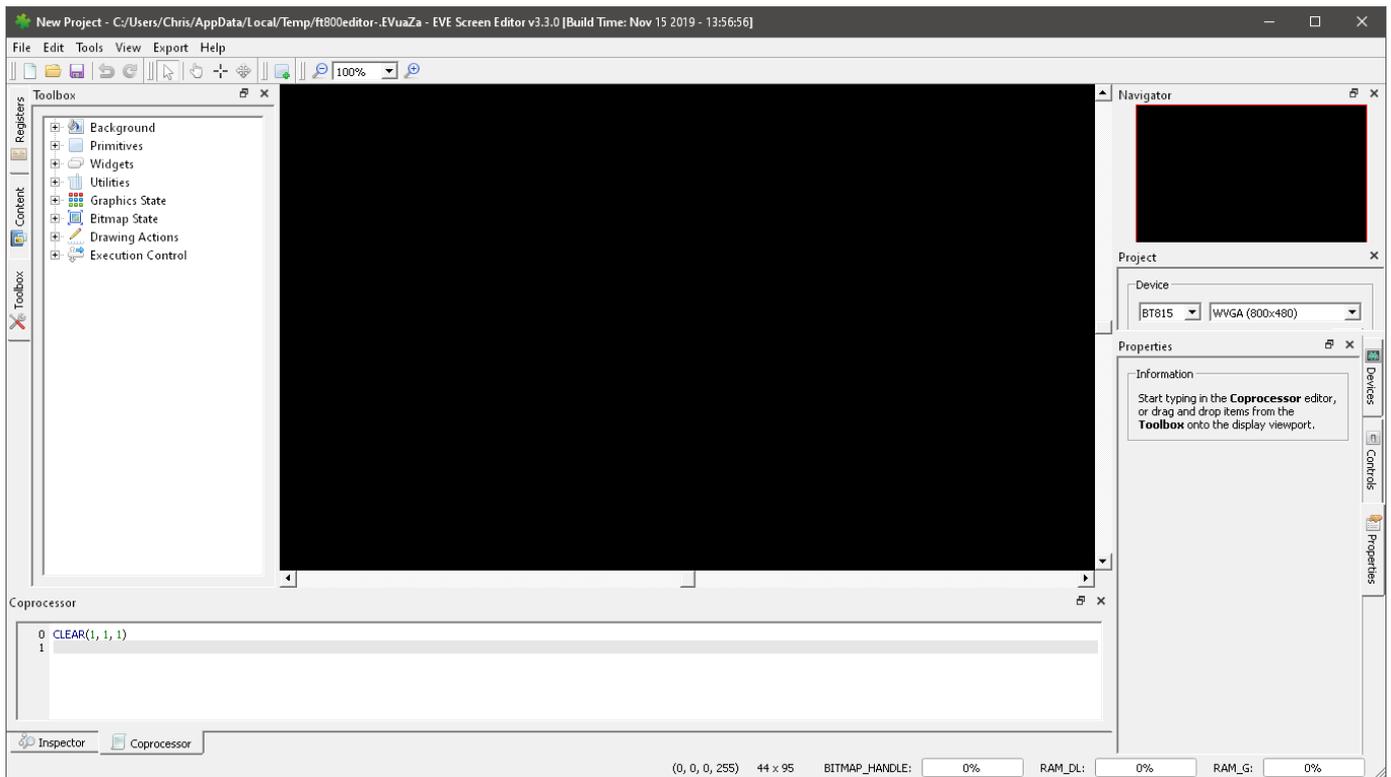
5.3 Setup & Configuration

To connect the FTDI SPI bridge to the EVE4 display, the configuration jumpers need to be placed between P7 and P8, as in the picture below.

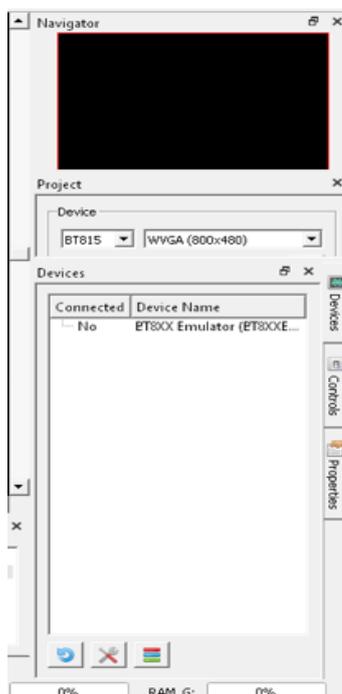
Set the backlight jumper (placed over the backlight power configuration pins) to 5V BL on P4 (also refer to the picture below). Please see description on how to connect power for backlight in section “Hardware features”, subsection “Backlight power supply”.



Start EVE Screen Editor and you will be greeted with the screen like the one below:



On the lower right-hand side of the window, click on the “Devices” tab.



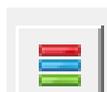
On the lower left-hand side, you will find 3 buttons:



This button refreshes the devices list above it;

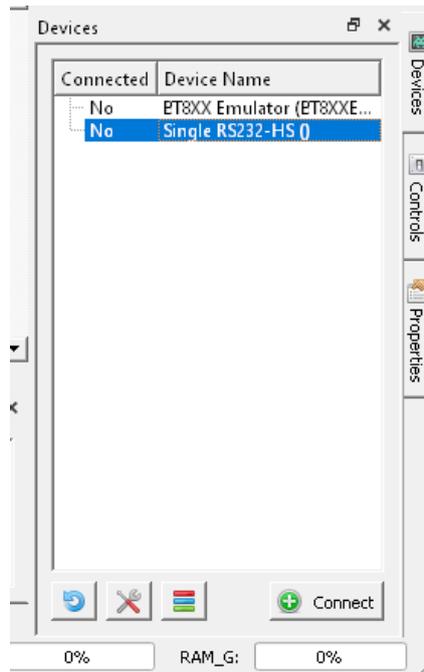


This button opens a menu to select one from the preconfigured displays list;



This button opens a menu to define your own display to be driven.

Use a USB cable to connect the “USB Direct” port to your computer, when running the EVE Screen Editor application. Click the “Refresh” button afterwards and your dev board should show up like in the picture below:

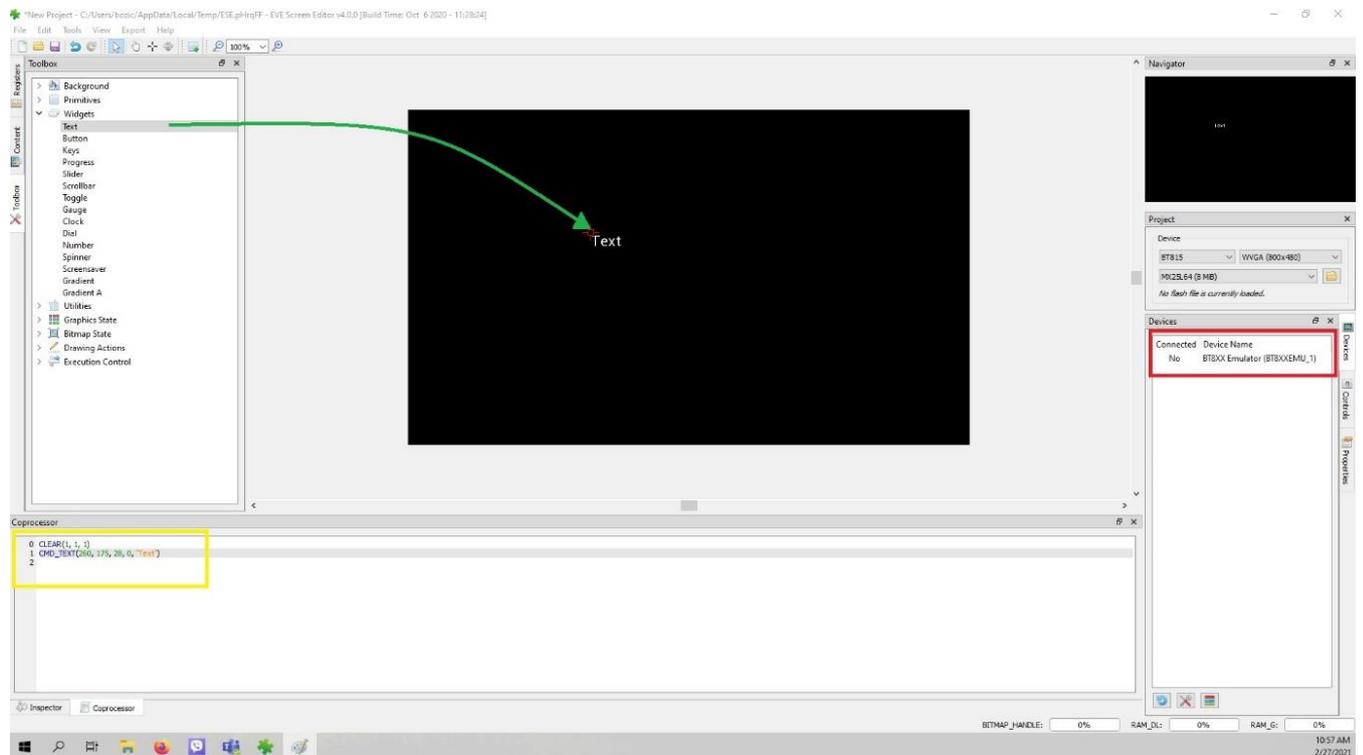


Select “Single RS232-HS ()” entry by clicking on it and use the ‘Connect’ button to let EVE Screen Editor try and boot up your display.

If everything works properly, your display should show a blue screen with some text.

5.4 Hello World

After connecting to STM32 Evaluation Board, to generate its first text message (e. g. 'Hello World'), we are going to use the EVE Screen Editor’s built-in drag & drop editor.





(The drag operation is shown in green; the generated coprocessor commands are shown in the yellow box and the button to send the data to the EVE display is seen inside the red box.)

What you see now is the preview of what will be drawn on the physical screen in a moment. Note that in the lower part of the window the coprocessor tab shows which EVE pre-processor commands were generated and will be sent to the EVE4 display shortly after.

To send the commands also drawn in the preview pan to the physical display, press the button labeled “**Upload RAM_G and RAM_DL**”.

6. EVALUATING RIVERDI EVE4 INTELLIGENT DISPLAY

6.1 A list of required items

- Riverdi STM32 Evaluation Board
- EVE4 enabled display
- RiBUS flexible flat cable (20 pins, 0.5mm pitch), 1 pcs
- Micro USB cable, 1 pcs
- Pre-loaded Micro SD card with demonstration files, 1 pcs
- 2.54mm pitch, 2x6pins Jumper, 1 pcs
- 2.54mm pitch, 1x2 pins Jumper, 1 pcs

Note 1: All accessories required are included into the package STM32 Evaluation Board.

Note 2: When the board is extracted from its ESD bag, check that no component remains in the bag. The main component to verify is the microSD card that may have been ejected from the Micro SD Slot.

6.2 Software ready to use

Riverdi has prepared official, ready-to-use software for the STM32 Evaluation board. The demonstration software is preloaded in the STM32 flash memory. And Mico SD card is pre-loaded with images, hex file and flash bin file which are associated for easy demonstration.

The latest versions of the demonstration software and associated files can be downloaded from [Riverdi GitHub](#).

6.3 Configuration

First, please connect Riverdi EVE4 display to RiBUS connector (P3) STM32 Evaluation Board by using the 150 mm long FFC.

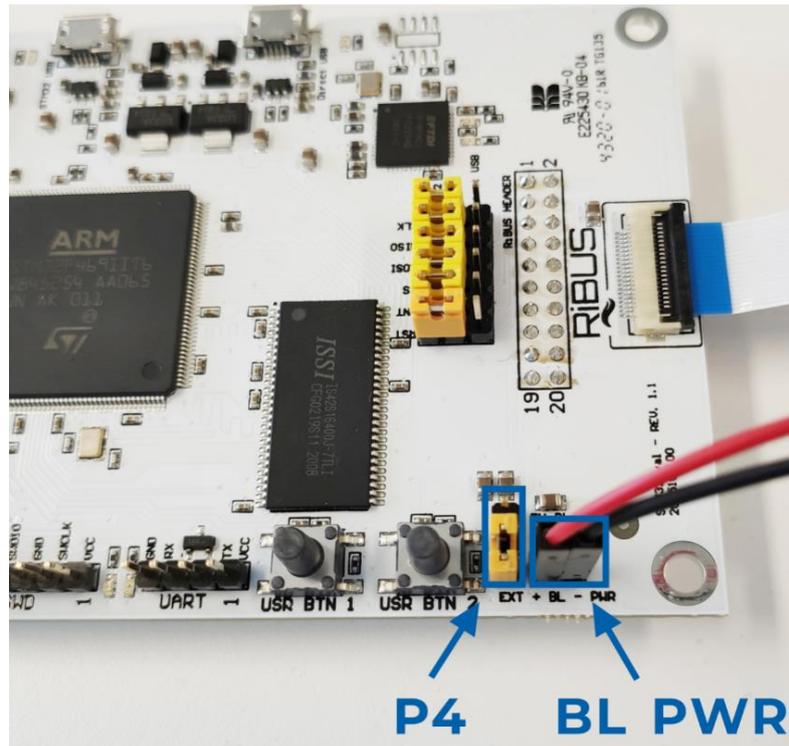
Second, the configuration jumpers, 2x6pins, need to be placed between P9 and P8. Check the jumper and the USB cable position (in ‘STM32 USB’ socket) in the picture below.



6.5.2 External

All the 10.1" (and rarely certain 7.0" displays) require external power supply for backlight, as the backlight voltage exceeds 5V and power consumption is over the USB standard. To provide adequate backlight power, set the jumper in P4 to lower position (it connects BL to EXT) – it must be placed in lower position and connect the external DC voltage source to neighboring connector ("BL PWR"). Refer to the picture and below.

Warning! There is no reverse polarity protection on EXT_BL_PWR, incorrect connection will damage the backlight permanently. Proceed carefully.



EVE4 BT817Q TFT series backlight power requirement summary:

Display size	Internal (from USB)	External
3.5"	OK	3.3V-6.0V (optional)
4.3"	OK	3.3V-6.0V (optional)
5.0"	OK	3.3V-6.0V (optional)
7.0"	Ok, if USB has 700 mA min. efficiency	3.3V-6.0V (optional)
10.1"	External Power Only	7.0-14.0V (necessary)

For any additional information please refer to the datasheets of the specific displays uploaded on our website:

<https://riverdi.com/product-category/intelligent-displays/bt817q/>



6.6 Quick start

It's very simple to get started using the demonstration software to evaluate different Riverdi EVE4 display.

Just follow these 5 steps:

1. Configure the config.txt to set the display size and display type

Insert the SD card into the computer, you'll need to find out the file named "config.txt". Double click to open the config.txt and set the parameters of "display" (display size) and "eve" (display type)

Here is an example on setting the parameters of "display" and "eve" for Riverdi 7.0 inch with EVE4 intelligent controller on the board:

```
display=70
```

```
eve=1
```

Please always save the changes then insert the SD card back on the STM32 Evaluation Board.

2. Power on the module

For the configuration on power supply, please refer to subchapter 6.4 and 6.5.

3. Wait around 20s until both LED1 and LED2 switch on sequentially and switch off completely.

Illuminated LED 1 indicates that the SMT32 flash is being erased.

Illuminated LED 2 indicates that the SMT32 flash is being programmed.

4. Press button "USR BTN1" to browse next picture and press button "RESET" to restart the demonstration program.

5. Test the touch panel performance by painting on "Drawing test" page.

The "Drawing test" only applied for display with touch panel.

6.7 Change demonstration pictures

Warning! To change the demonstration picture successfully, the resolution and format of the picture must be set correctly.

The resolution of the picture must be the same as the display itself resolution.

Pictures with BMP format can provide best demonstration effect. However, the picture format must be RAW for Riverdi EVE4 7.0" and 10.1 "series.

Please refer to subchapter 6.8 on how to convert the picture format from BMP into RAW.

1. Copy the new demonstration pictures to Micro SD card

Please copy new demonstration pictures to the folder named with the same resolution as the picture.

2. Rename the new demonstration pictures with numbers



First, delete or rename the pre-loaded demonstration pictures.

Second, rename the new demonstration pictures with any number from 0 to 3. The number determines the sequence of demonstration pictures.

3. Loading new demonstration images

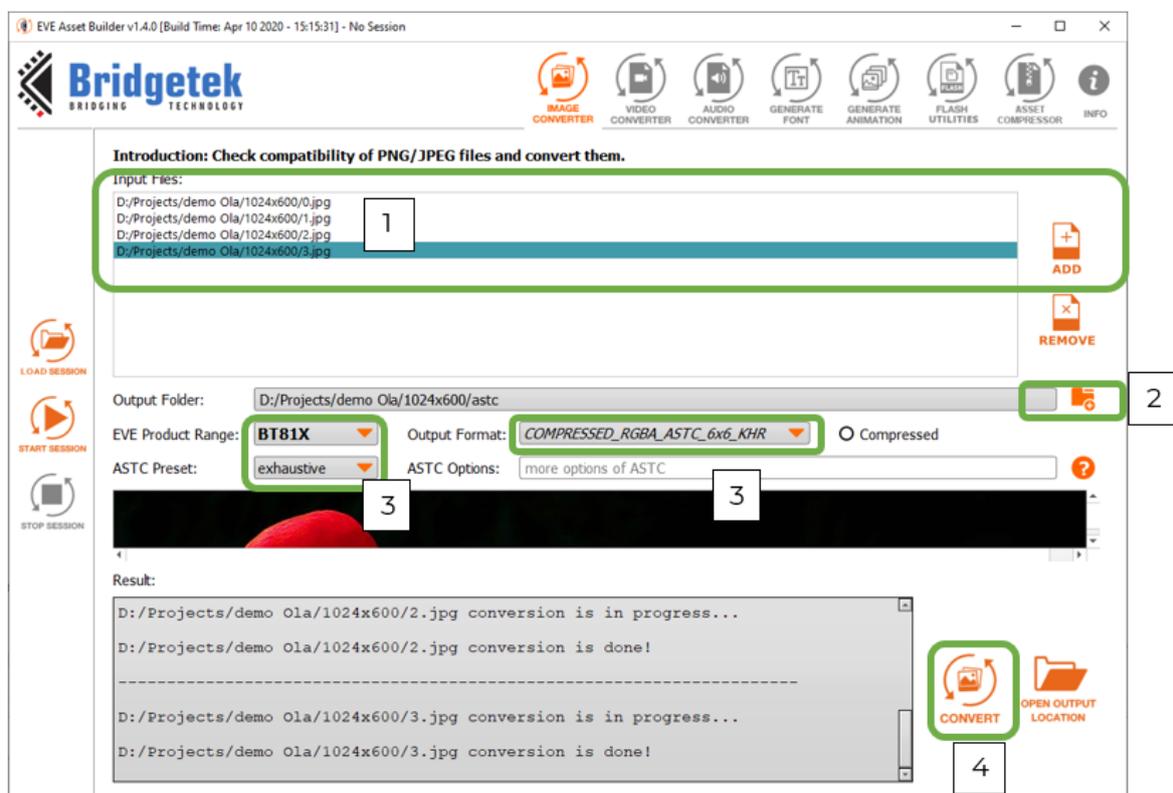
Insert the Micro SD card back and power up the module.

Additionally, to load new demonstration images for EVE4 displays 7.0" and 10.1", please keep holding button "BTN2". Then press "RST" 1 time. Release the button "BTN2" until **loading images to flash memory** will appear on the screen.

6.8 How to convert the picture format from BMP into RAW

Steps on how to convert the picture format from .BMP into .RAW.

- Download and install the latest version of EVE Asset Builder (EAB) from below link: <https://brtchip.com/ic-module/toolchains/>
- Run EVE Asset Builder and follow below 4 steps:



- Add target picture with correct resolution
- Locate the output folder path
- Set the below 3 parameters as the above figure shows:

EVE Product Range: **BT81X**

ASTC Preset: **exhaustive**

Output Format: **COMPRESSED_RGBA_ASTC_6X6KHR**

- Click Convert

4 different types of files will be generated. However, please only keep the RAW file and delete other 3 files.

7. EVALUATING RIVERDI HIGH BRIGHTNESS, IPS DISPLAY

A list of required items

- Riverdi STM32 Evaluation Board
- [Riverdi High Brightness, IPS display](#) + [Matching Don ADDON Board](#)
- Micro USB cable, 1 pcs
- Pre-loaded Micro SD card with demonstration files, 1 pcs
- 2.54mm pitch, 1x2 pins Jumper, 1 pcs

Note 1: All accessories required are included into the package of STM32 Evaluation Board.

Note 2: When the board is extracted from its ESD bag, check that no component remains in the bag. The main component to verify is the microSD card that may have been ejected from the Micro SD Slot.

7.1 Software ready to use

The demonstration software is preloaded in the STM32 flash memory. And Micro SD card is pre-loaded with images, hex file and flash bin file which are associated for easy demonstration.

The latest versions of the demonstration software and associated files can be downloaded from [Riverdi GitHub](#)

7.2 Hardware configuration

First, Connect Riverdi High Brightness, IPS display to the matching Don Addon Board.

Second, Plug on the STM32 Evaluation board on the top of the Don Addon Board.





7.3 Module power supply

For the configuration on power supply, please refer to subchapter 6.4 and 6.5.

7.4 Quick start

It is very simple to get started using the STM32 Evaluation Board to evaluate the Riverdi High Brightness, IPS displays.

Just follow these 5 steps:

1. Configure the config.txt to set the display size and display type

Insert the SD card into the computer, you'll need to find out the file named "config.txt".

Double click to open the config.txt and set the parameters of "display" (display size) and "eve" (display type)

Here is an example on setting the parameters of "display" and "eve" for Riverdi High Brightness, IPS 7.0 inch without EVE4 intelligent controller on the board:

```
display=70
```

```
eve=0
```

Please always save the changes then insert the SD card back on the STM32 Evaluation board.

Warning! To evaluate Riverdi High Brightness, IPS 10.1" series display with LVDS interface, `eve=1` is the only option. Because EVE4 controller is already on Don Addon 101.

2. Power on the module

For the configuration on power supply, please refer to subchapter 6.4 and 6.5.

3. Wait around 20s until both LED1 and LED2 switch on sequentially and switch off completely.

Illuminated LED 1 indicates that the SMT32 flash is being erased.

Illuminated LED 2 indicates that the SMT32 flash is being programmed.

4. Press button "USR BTN1" to browse next picture and press button "RESET" to restart the demonstration program.

5. Test the touch panel performance by painting on "Drawing test" page.

The "Drawing test" only applied for display with touch panel.

7.5 Change demonstration pictures

Warning! To change the demonstration picture successfully, the resolution and format of the picture must be set correctly.

The resolution of the picture must be the same as the display itself resolution and pictures with BMP format can provide best demonstration effect.

Warning! Because EVE4 controller is already on Don Addon 101, the picture format must be RAW when changing the demonstration pictures for Riverdi High Brightness, IPS 10.1 "series.



Please refer to [sub chapter 6.8](#) on how to convert the picture format from BMP into RAW.

1. Copy the new demonstration pictures to Micro SD card

Please copy new demonstration pictures to the folder

2. Rename the new demonstration pictures with numbers

First, delete or rename the pre-loaded demonstration pictures.

Second, rename the new demonstration pictures with any number from 0 to 3. The number determines the sequence of demonstration pictures.

3. Load the new demonstration images

Insert the Micro SD card back and power up the module.

Warning! To load new demonstration images for Riverdi High Brightness, IPS 10.1” series, please keep holding button “BTN2”. Then press” RST” 1 time. Release the button “BTN2” until [loading images to flash memory](#) will appear on the screen.

8. HARDWARE LAYOUT

8.1 Microcontroller

STM32F469II, Arm Cortex-M4 MCU @ up to 180 MHz

8.2 External SDRAM

IS42S16400J, 64 Mbit

<http://www.issi.com/WW/pdf/42-45S16400J.pdf>

8.3 FTDI serial to SPI Bridge

https://www.ftdichip.com/Support/Documents/DataSheets/ICs/DS_FT232H.pdf

8.4 Micro SD slot

When functional microSD card is placed in this slot, after being formatted in FAT32 format, microSD card’s memory space can be used by microcontroller as the regular filesystem.

8.5 RiBUS connector

Support for BT817Q (max SPI speed = 30MHz),

<https://riverdi.com/product/zif0520dh-cf25/>

FTDI app note AN312 contains c headers and example code for FT800.

8.6 User LEDs: 2 pcs

They can be configured by the user, from program level.

8.7 Power LED indicating power to FTDI “DIRECT USB”

FTDI input powers both rails.

8.8 Power LED indicating power to “STM32 USB”

STM32 powers its own rail only.



8.9 User buttons: 2 pcs

These may be used in future; they are not used.

8.10 Serial RGB bus header

Please refer to Application Note: ST AN4861 (LCD-TFT display controller (LTDC) on STM32 MCUs).

9. ADDITIONAL LITERATURE

All the below sources contain the data of BT817 (EVE4) ICs.

BT81x, General and Datasheets:

<https://brtchip.com/ic-module/product-category/products/ic/eve4-ic/>

BT81x, Programming Guides:

<https://brtchip.com/ic-module/document/programming-guides/>

10. SUMMARY

If this document has made you interested in knowing more about Riverdi products, please visit Riverdi website:

<https://riverdi.com/product-category/evaluation-boards/>



11. WARRANTY LIMITATION

End user is instructed how to connect external power sources to the unit, which brings the potential threats to the STM32 Evaluation Board and display. Riverdi cannot be held responsible for actions beyond its control and consequently the warranty DOES NOT cover the effects of reversed power supply polarity on backlight terminals. Refer to clause in red color in section [6.5.2 EXTERNAL](#) of this document.

12. LEGAL INFORMATION

This document has been issued for informational purposes only. Riverdi did their best to avoid any errors, but we do not grant full warrant it is 100% errors free. Please contact Riverdi if you find any mistakes or when you think some important information is missing in this Manual. It can be updated or altered without any written notice. Riverdi cannot be held responsible for not announcing any changes or issuing next revisions or versions of this document.

Hi, I am here to help you!
If you have any additional
questions, please contact
our support via email:
contact@riverdi.com

