



## RIVERDI STM32 Evaluation Board

### User Manual

Rev. 1.4  
2021-06-02

## REVISION RECORD

REVNO.	REVDATE	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	

## CONTENTS

REVISION RECORD.....	2
1 Target readers .....	4
2 Overview.....	4
3 Introduction.....	5
4 Board functionality test.....	5
5 Interfacing with EVE Displays .....	6
5.1 Using the FTDI SPI Bridge & EVE Screen Editor .....	6
5.2 EVE Screen Editor Installation .....	6
5.3 Setup & Configuration.....	6
5.4 Hello World.....	9
6 Using the SPI on the STM32 .....	10
6.1 Prerequisites.....	10
6.2 Installation.....	10
6.3 Configuration.....	10
7 Hardware features .....	11
7.1 Module power supply .....	11
7.2 Backlight power supply .....	11
7.2.1 Internal .....	11
7.2.2 External.....	12
7.3 Microcontroller.....	13
7.4 External SDRAM.....	13
7.5 FTDI serial to SPI bridge.....	13
7.6 MicroSD slot .....	13
7.7 RiBUS FFC-connector .....	13
7.8 User LEDs: 2 pcs.....	13
7.9 Power LED indicating power to FTDI "Direct USB" .....	13

- 7.10 Power LED indicating power to STM32 "STM32 USB" ..... 13
- 7.11 User Buttons: 2 pcs..... 13
- 7.12 Serial RGB bus header ..... 13
- 8 Additional literature ..... 14
- 9 Warranty limitation ..... 14
- 10 Legal information ..... 14
- 11 Appendix..... 15
  - 11.1 Hardware Pinouts..... 15
  - 11.2 RiBUS Connector Pinout..... 15
  - 11.3 P3 pinout ..... 16

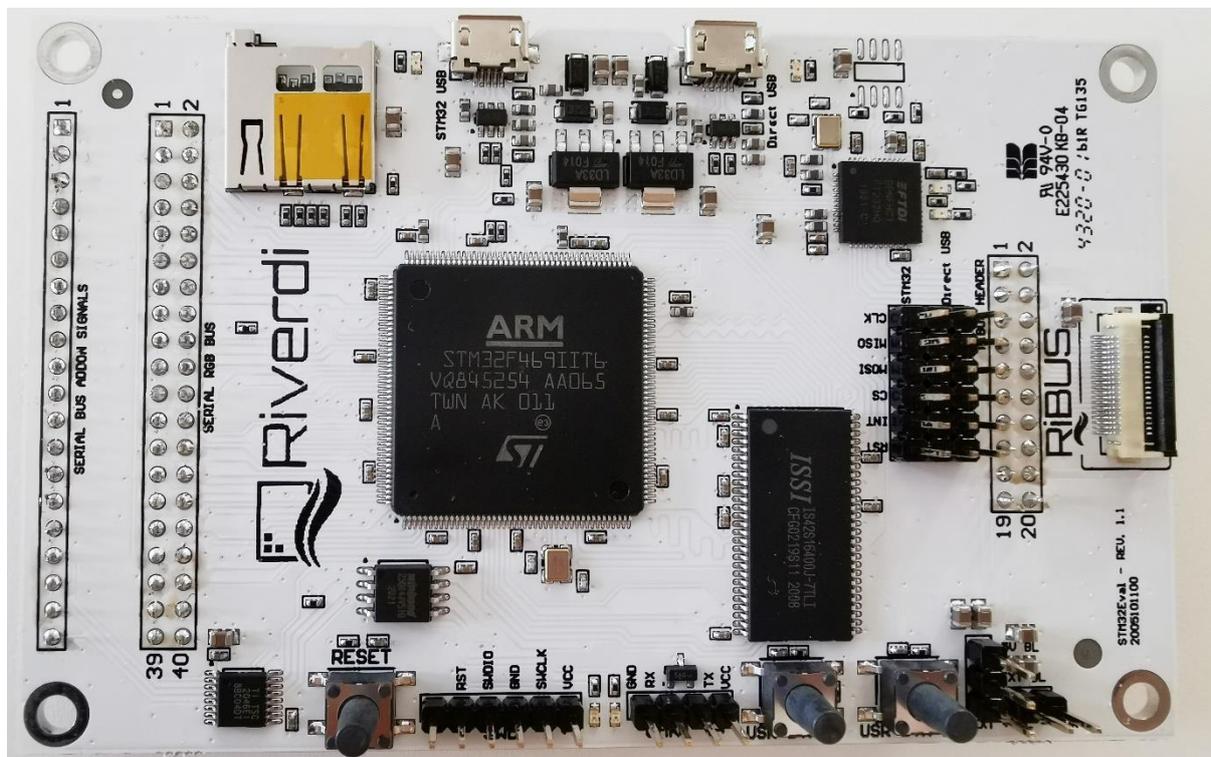
## 1 Target readers

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 Overview

The Riverdi evaluation board is designed as a complete demonstration and development platform for Riverdi's EVE and IPS displays lines driver technology.

The Riverdi evaluation board 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).

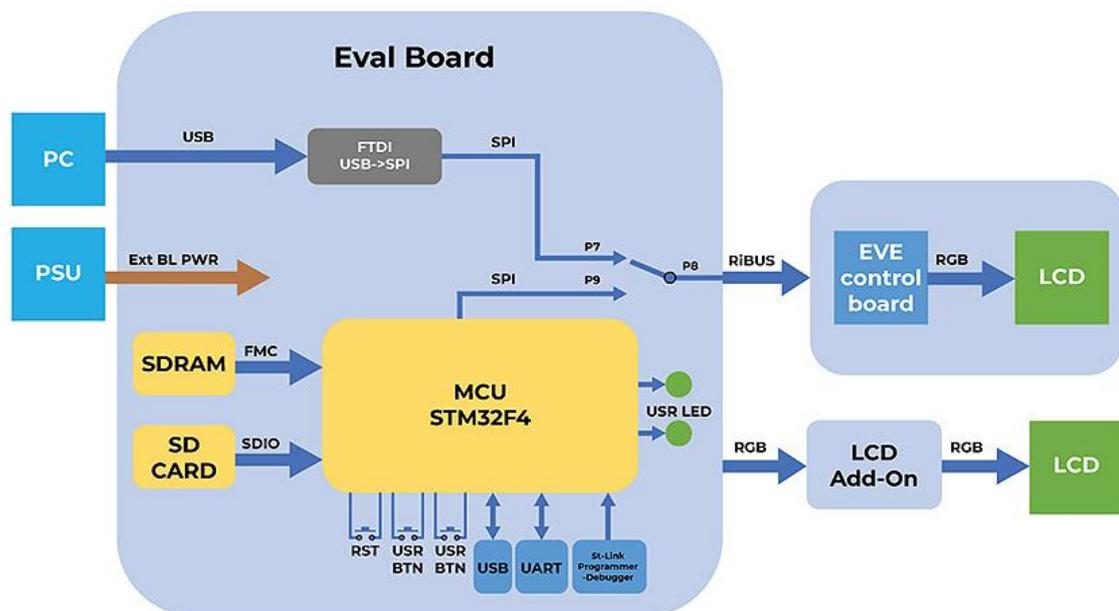


### 3 Introduction

**Riverdi STM32 Evaluation Board** is a tool designed to help get you started on working with Riverdi products. It not only supports EVE modules but also RGB displays (in combination with touch panels) by Riverdi.

You have two 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 onboard STM32F4 to develop and test firmware for driving a connected display or display controller, like the FT80x, FT81x and BT81x series.



### 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

### 5.1 Using the FTDI SPI Bridge & EVE Screen Editor

Prerequisites:

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

### 5.2 EVE Screen Editor Installation

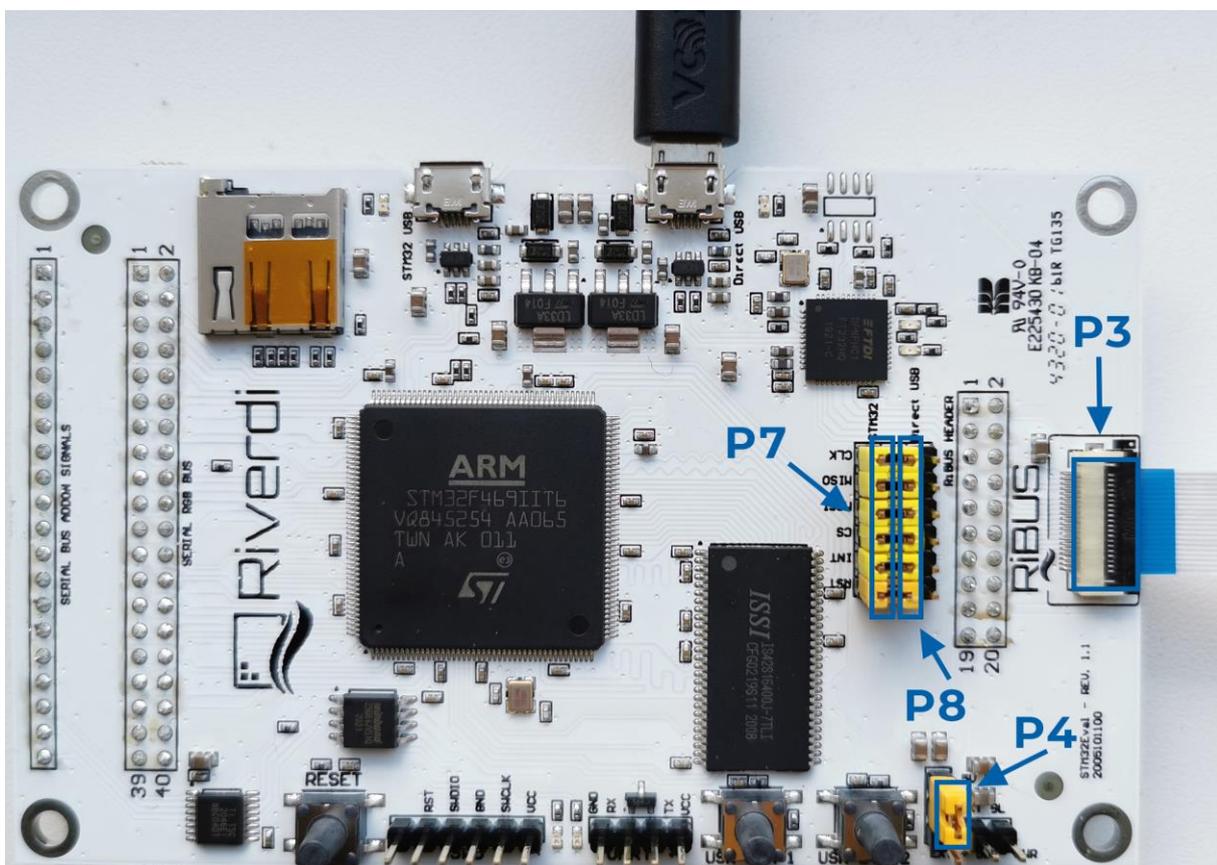
Download and install the EVE screen Editor from the FTDI homepage:

<https://www.ftdichip.com/Support/Utilities.htm#EVEScreenEditor>

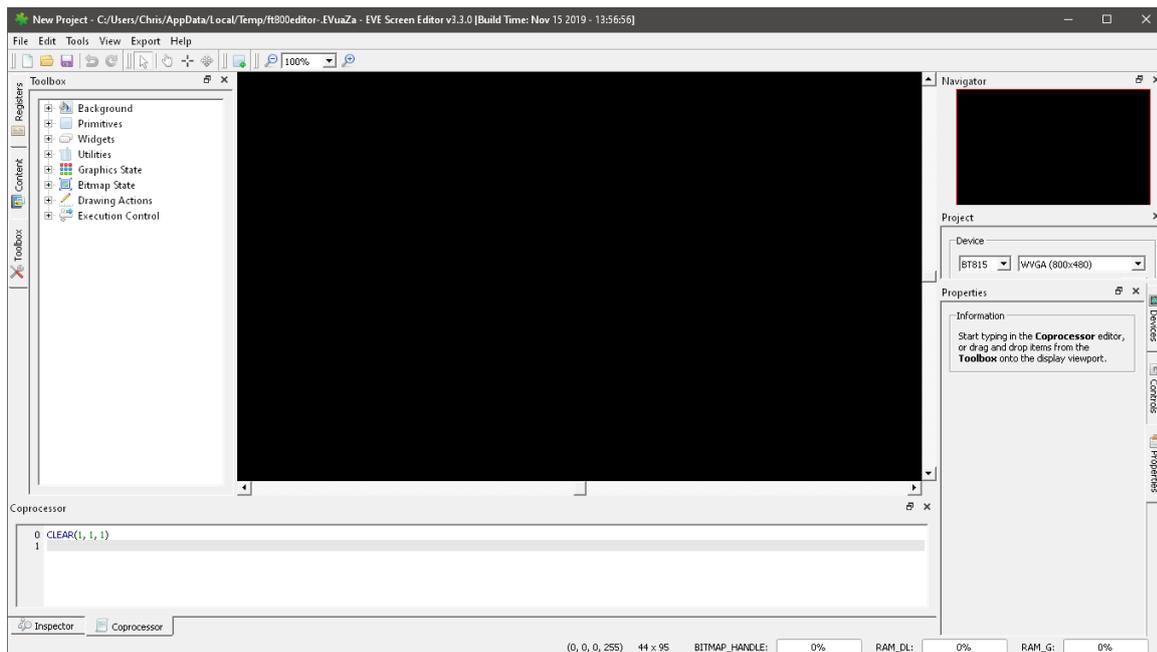
### 5.3 Setup & Configuration

To connect the FTDI SPI bridge to the EVE 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 similar to 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;

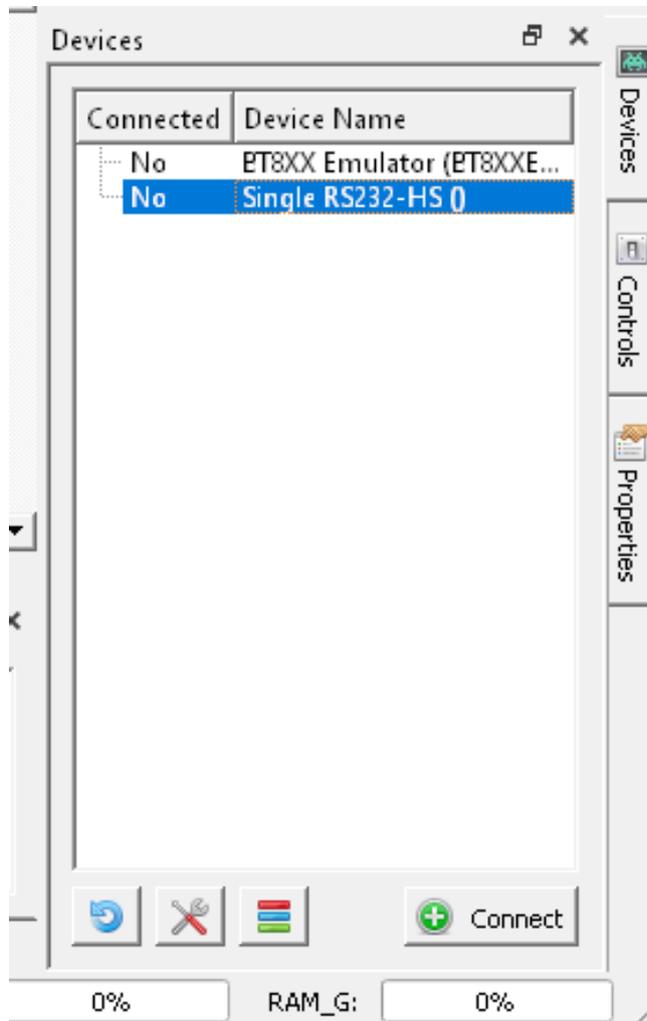


This button opens a menu to select one from the preconfigured displays list;



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:

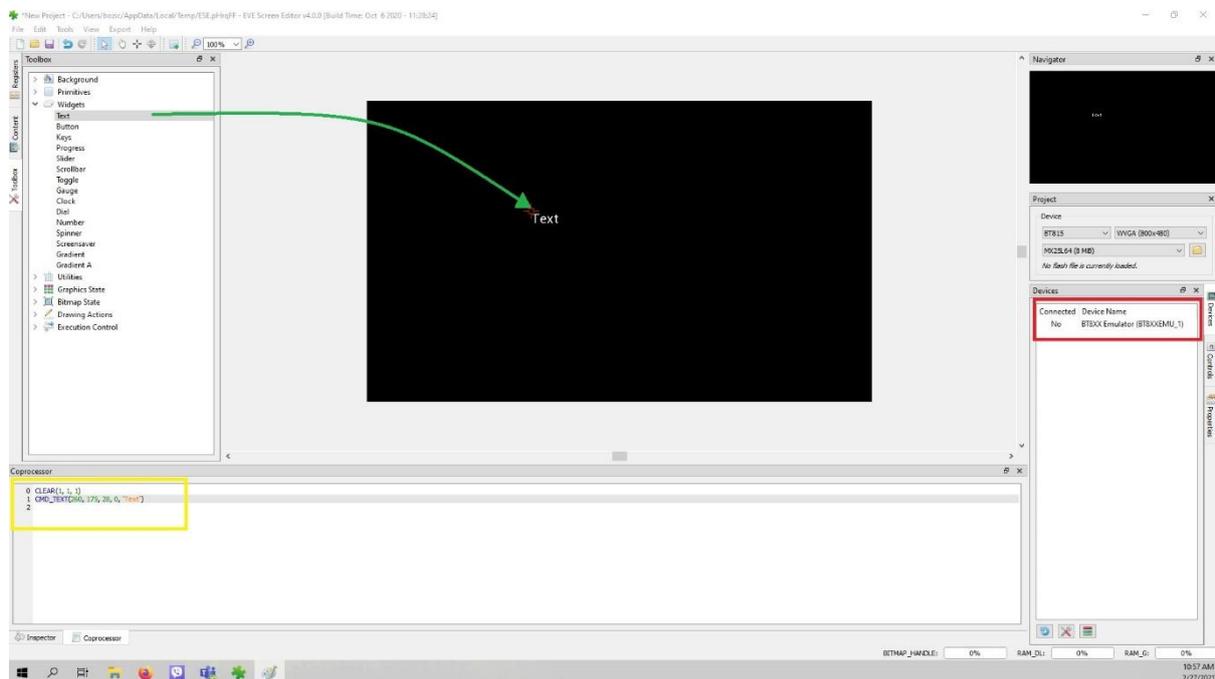


Select "Single RS232-HS ()" entry by clicking on it and use the 'Connect' button to let EVE Screen Editor try and boot up your display.

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

## 5.4 Hello World

After connecting to Eval 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 EVE 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 Using the SPI on the STM32

### 6.1 Prerequisites

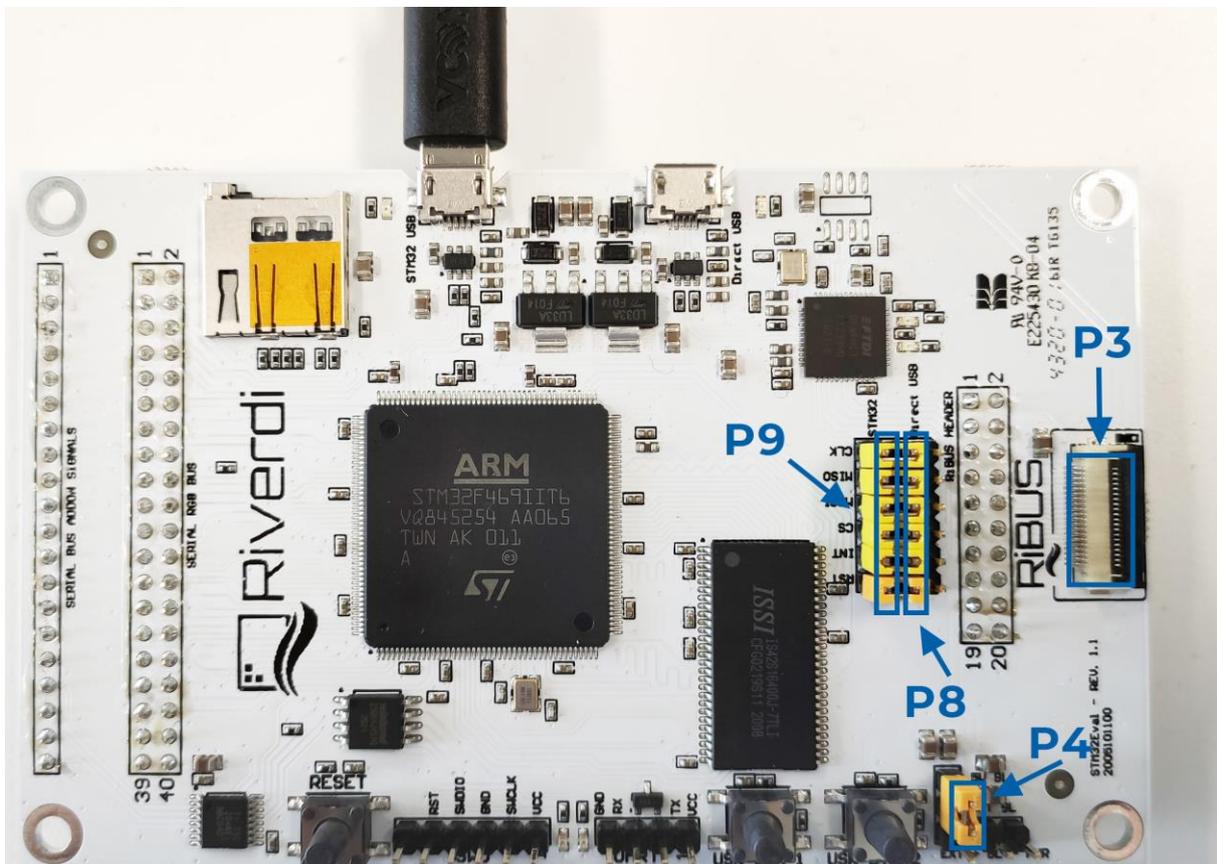
- Riverdi STM32 Evaluation Board
- EVE enabled display
- RiBUS flexible flat cable (FFC)
- Your favorite tool to flash the onboard STM32 (assuming that you use STM32CubeProgrammer together with an STLink v2 compatible ISP Programmer)

### 6.2 Installation

Use the provided source code or the pre-compiled binary file.

### 6.3 Configuration

In order to connect the STM32 to the EVE display, the configuration jumpers need to be placed between P9 and P8. Check the jumper and the USB cable position (in 'STM32 USB' socket) in the picture below.



## 7 Hardware features

### 7.1 Module power supply

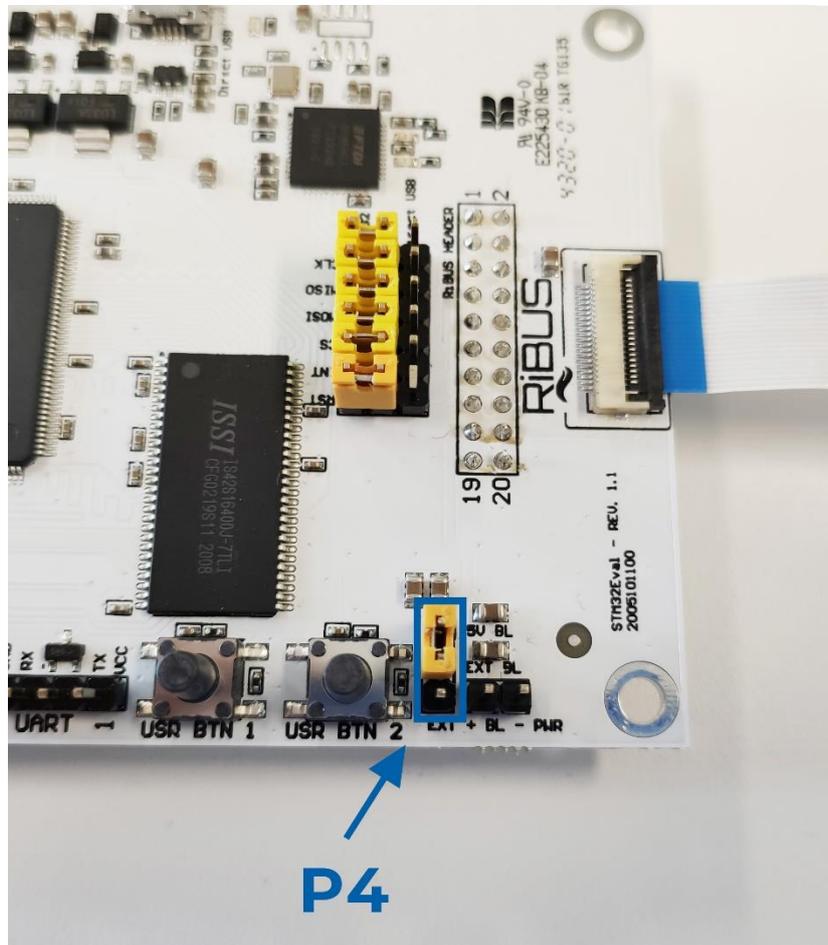
Possible to deliver from one of 2 USB ports on Eval Board (“Direct USB” or “STM32 USB”), in accordance with USB standard (5.0 VDC max.)

### 7.2 Backlight power supply

#### 7.2.1 Internal

For display sizes from 3.5” to 5.0”, the USB port gives enough power to get adequate backlight level. Such backlight power supply configuration (jumper is in higher position, connects BL to 5V on P4) is shown in the picture below.

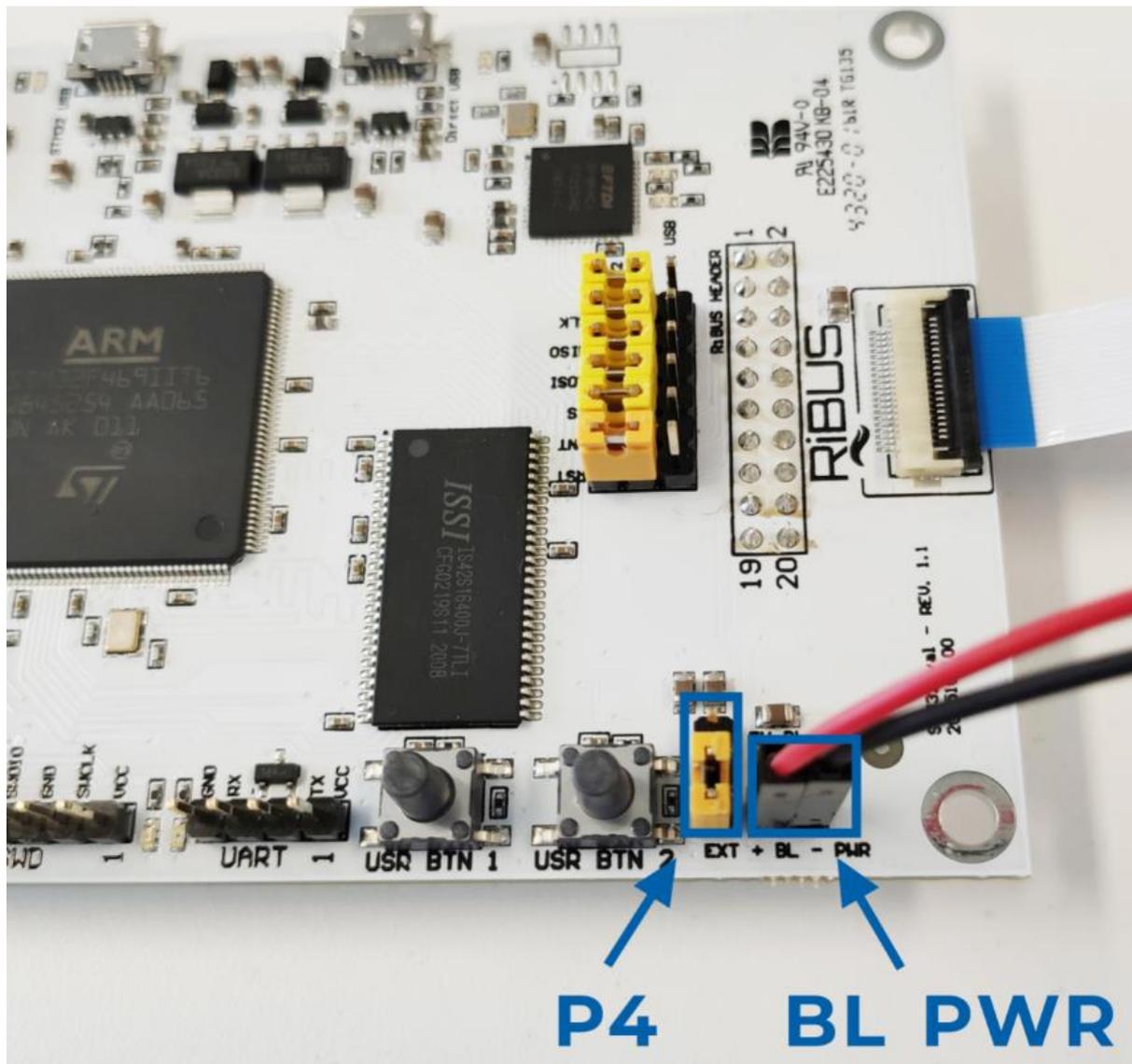
For 7.0” displays, USB minimal power capability needs to be 700mA @ 5V (this is a combined power of Eval Board, BT817Q board and backlight). Please make sure your USB source has enough current efficiency. If not, use external 5V power source in the way described in point 6.2.2.



7.2.2 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.

**Caution!** 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 700mA min. efficiency	3.3V-6.0V (optional)
10.1"	External Power Only	5.0-14.0V (necessary)

You can find exact currents for specific TFT in datasheet:

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

### 7.3 Microcontroller

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

### 7.4 External SDRAM

IS42S16400J, 64Mbit

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

### 7.5 FTDI serial to SPI bridge

[https://www.ftdichip.com/Support/Documents/DataSheets/ICs/DS\\_FT232H.pdf](https://www.ftdichip.com/Support/Documents/DataSheets/ICs/DS_FT232H.pdf)

### 7.6 MicroSD 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.

### 7.7 RiBUS FFC-connector

Support for FT80x, FT81x, BT81x (max SPI speed = 30MHz),

<https://riverdi.com/download/5318/>

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

### 7.8 User LEDs: 2 pcs

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

### 7.9 Power LED indicating power to FTDI "Direct USB"

FTDI input powers both rails.

### 7.10 Power LED indicating power to STM32 "STM32 USB"

STM32 powers its own rail only.

### 7.11 User Buttons: 2 pcs

These may be used in future, they are not used now.

### 7.12 Serial RGB bus header

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

## 8 Additional literature

All the below sources contain the data of four BT815/816 (EVE3) and BT817/BT818 (EVE4) ICs

**BT81x, General:** <https://brtchip.com/bt81x/>

**BT81x, Datasheets:**

[https://brtchip.com/wp-](https://brtchip.com/wp-content/uploads/Support/Documentation/Datasheets/ICs/EVE/DS_BT81X.pdf)

[content/uploads/Support/Documentation/Datasheets/ICs/EVE/DS\\_BT81X.pdf](https://brtchip.com/wp-content/uploads/Support/Documentation/Datasheets/ICs/EVE/DS_BT81X.pdf)

**BT81x, Programming guides:** [https://brtchip.com/wp-](https://brtchip.com/wp-content/uploads/Support/Documentation/Programming_Guides/ICs/EVE/BRT_AN_033_BT81X_Series_Programming_Guide.pdf)

[content/uploads/Support/Documentation/Programming\\_Guides/ICs/EVE/BRT\\_AN\\_033\\_BT81X\\_Series\\_Programming\\_Guide.pdf](https://brtchip.com/wp-content/uploads/Support/Documentation/Programming_Guides/ICs/EVE/BRT_AN_033_BT81X_Series_Programming_Guide.pdf)

## 9 Warranty limitation

End user is instructed how to connect external power sources to the unit, which brings the potential threats to the Eval 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 6.2.2 of this document

## 10 Legal information

This document has been issued with professional care. 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.

## 11 Appendix

### 11.1 Hardware Pinouts

#	Pin	Description	MCU Peripheral
25	PF7	User Led 1 (left)	GPIO Output
26	PF8	User Led 2 (right)	GPIO Output
53	PA7	User Button 1	GPIO Input (enable pull-up)
50	PA4	User Button 2	GPIO Input (enable pull-up)
130	PH15	uSD Detect ( <b>hi: uSD present</b> )	GPIO Input (enable pull-up)
40	PA0	STL_TX (UART)	UART4 TX
41	PA1	STL_RX (UART)	UART4 RX
95	PB15	R_MOSI (SPI2)	SPI2 MOSI
94	PB14	R_MISO	SPI2 MISO
93	PB13	R_CLK	SPI2 SCK
92	PB12	R_CS	SPI2 NSS
86	PH9	R_INT	GPIO Input
84	PH10	R_RST	GPIO Output

### 11.2 RiBUS Connector Pinout

The signals listed here are also found on the RiBUS breakout header P3		
Pin	Name	Description
1	VDD	Power Supply - 3.3V
2	GND	Ground
3	SPI_SCLK	SPI SCK Signal
4	MISO / IO.1	PI MISO Signal / QSPI data line 1
5	MOSI / IO.0	PI MISO Signal / QSPI data line 0
6	CS	SPI Chip Select Signal
7	INT	Interrupt Signal (Out to MCU)
8	RST / PD	Reset / Power Down Signal

<b>9 - 14</b>	NC	NC
<b>15</b>	RX	UART RX / I2C
<b>16</b>	TX	UART TX / I2C
<b>17</b>	BLVDD	Backlight Power Supply, 5V
<b>18</b>	BLVDD	Backlight Power Supply, 5V
<b>19</b>	BLGND	Backlight Ground (GND on display)
<b>20</b>	BLGND	Backlight Ground (GND on display)

### 11.3 P3 pinout

GND	<b>1</b>	<b>2</b>	3.3V VCC
MOSI	<b>3</b>	<b>4</b>	SCK
nCS	<b>5</b>	<b>6</b>	MISO
nRST	<b>7</b>	<b>8</b>	nINT
NC	<b>9</b>	<b>10</b>	NC
NC	<b>11</b>	<b>12</b>	NC
NC	<b>13</b>	<b>14</b>	NC
TX	<b>15</b>	<b>16</b>	RX
5V Backlight	<b>17</b>	<b>18</b>	5V Backlight
GND	<b>19</b>	<b>20</b>	GND

