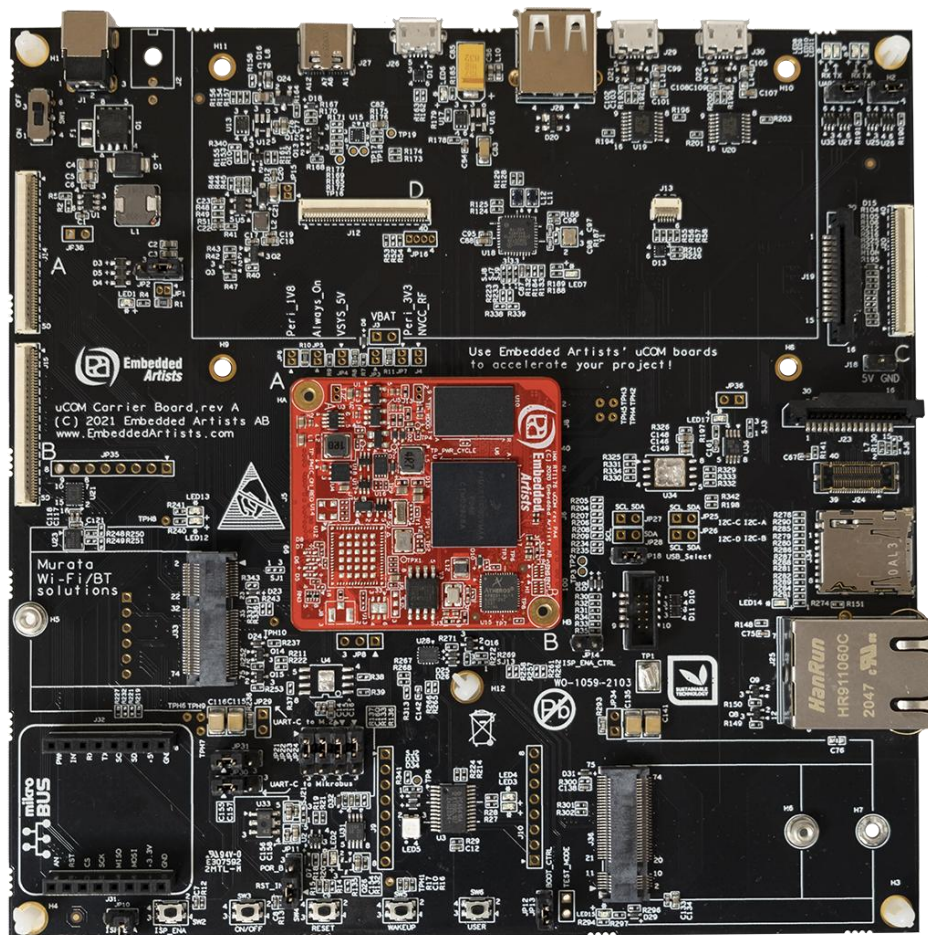


iMX RT1176 Developer's Kit - User Guide

Copyright 2021 © Embedded Artists AB

iMX RT1176 Developer's Kit User Guide



*Get Up-and-Running Quickly and
Start Developing Your Application On Day 1!*

Embedded Artists AB

Rundelsgatan 14
211 36 Malmö
Sweden

<https://www.EmbeddedArtists.com>

Copyright 2021 © Embedded Artists AB. All rights reserved.

No part of this publication may be reproduced, transmitted, transcribed, stored in a retrieval system, or translated into any language or computer language, in any form or by any means, electronic, mechanical, magnetic, optical, chemical, manual or otherwise, without the prior written permission of Embedded Artists AB.

Disclaimer

Embedded Artists AB makes no representation or warranties with respect to the contents hereof and specifically disclaim any implied warranties or merchantability or fitness for any particular purpose. Information in this publication is subject to change without notice and does not represent a commitment on the part of Embedded Artists AB.

Feedback

We appreciate any feedback you may have for improvements on this document. Please send your comments to support@EmbeddedArtists.com.

Trademarks

All brand and product names mentioned herein are trademarks, services marks, registered trademarks, or registered service marks of their respective owners and should be treated as such.

Table of Contents

1	Document Revision History	4
2	Getting Started	5
2.1	iMX RT1176 Developer's Kit Content	5
2.2	Hardware Overview	6
2.3	Connecting - Get Started	7
2.3.1	Console	7
2.3.2	Tera Term Terminal Emulation Application	7
2.3.3	PuTTY terminal emulation application	9
2.3.4	Powering	9
2.3.5	Console output	10
2.4	Alternative Powering	10
2.5	ESD Precaution	10
2.6	Note uCOM Orientation when Mounting	11
2.7	General Handling Care	12
2.8	OTP Fuse Programming	12
2.9	CE Assessment	12
3	uCOM Carrier Board Design	13
3.1	Ethernet Interface Adapter	14
4	Disclaimers	15
4.1	Definition of Document Status	16

1 Document Revision History

<i>Revision</i>	<i>Date</i>	<i>Description</i>
PA1	2021-03-08	Initial release.
PA2	2021-06-17	Minor layout corrections.
PA3	2021-09-20	Updated information about the <i>uCOM Carrier Board</i> hardware.
PA4	2021-12-17	Added information about Ethernet adapter.

2 Getting Started

This chapter contains information about how to get acquainted with the *iMX RT1176 Developer's Kit*. **Please read this chapter first before you start using the board - it will be well spent time!**

First of all, thank you for buying Embedded Artists' *iMX RT1176 Developer's Kit* based on NXP's ARM Cortex-M7/M4 i.MX RT1176 Crossover MCU. **You will get up-and-running quickly!**

- Section 2.1 contains a list of what is included in the *iMX RT1176 Developer's Kit*.
- Section 2.2 together with Figure 10 in chapter 3 gives an overview presentation of the hardware and the interfaces and connectors available.
- Section 2.3 describes how to connect the USB cable, install the UART-to-USB driver and power-up the board the first time.
- Section 2.4 presents an alternative powering solution via the USB console interfaces.
- Section 2.5 - 2.9 describes important handling and care issues.
- Chapter 3 presents the *uCOM Carrier Board* and where to find more information about the hardware design of it.

To get started with program development and program download/flashing, see document *iMX RT Developer's Kit Program Development Guide*.

2.1 iMX RT1176 Developer's Kit Content

- One *iMX RT1176 uCOM* board mounted on one *uCOM Carrier board*, see Figure 1 below.
- One 100/10Mbps Ethernet adapter
- One 40 pos, 0.5 mm pitch, 50 mm long flat cable
- One MIPI-to-HDMI adapter
- One 12V supply
- One micro-B to A USB cable
- One MCU-Link debug interface

For program development you can optionally use another debug probe (than MCU-Link), like MCU-Link Pro, ULINK, J-LINK or LPC-Link2, and a program development environment, like MCUXpresso, Keil uVision or IAR Embedded Workbench. For more information about program development, see document *iMX RT Developer's Kit Program Development Guide*.

2.2 Hardware Overview

Figure 1 below illustrates the top side of the *uCOM Carrier board*. Some key components, relevant to get started, have been marked in the picture.

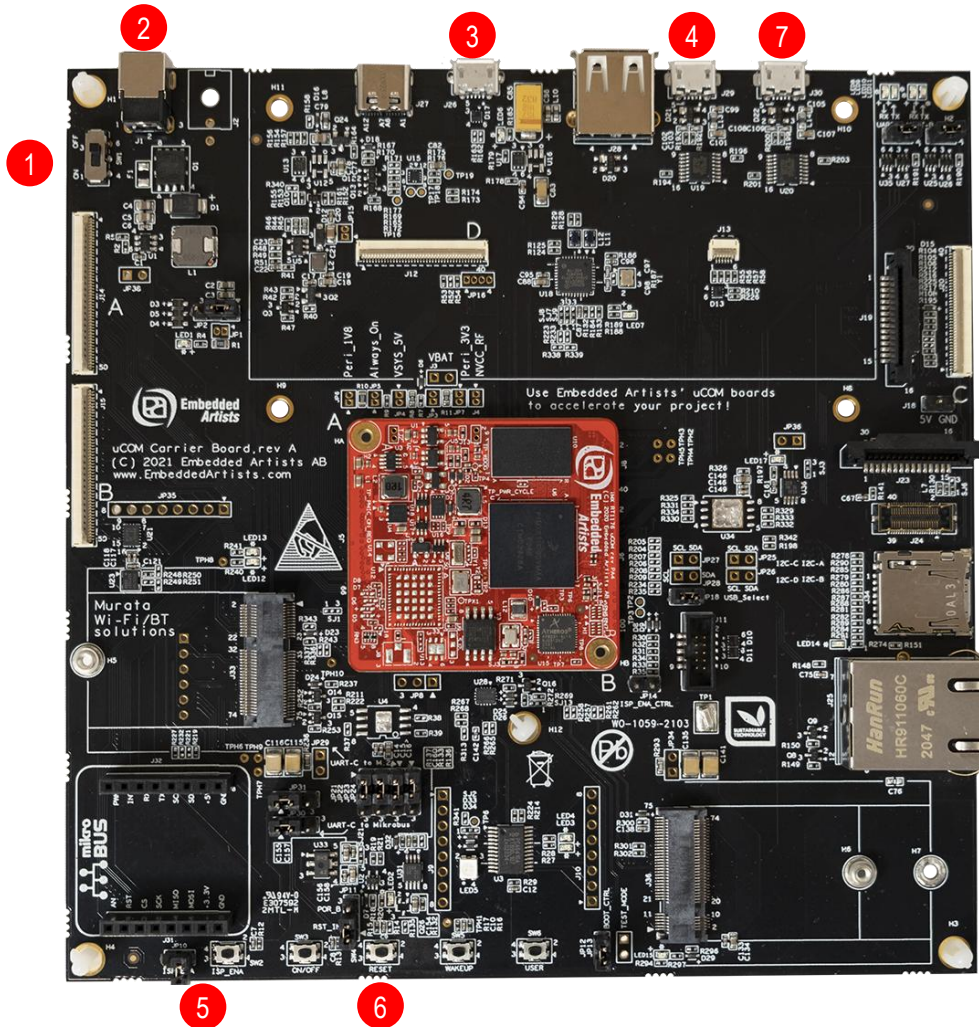


Figure 1 – iMX RT1176 Developer's Kit

1. ON/OFF switch (instead of having to plug in/out the 12V power supply barrel connector).
2. 12V power supply input, 12V/2-3A DC, via a 2.1mm power jack. The center position is the positive terminal.
3. USB OTG connector - this USB interface can, together with a PC application, be used to program the flash memory of the *iMX RT1176 uCOM board*.
4. UART-to-USB bridge - this gives access to the console UART for the Cortex-M7 core.
5. ISP Enable push-button (and jumper, left of button) - pressing this button (or shorting jumper) while the board power up will place the *iMX RT1176* in ISP mode (typically used for programming the *iMX RT1176 uCOM board* flash memory).
6. Reset push-button - a press will generate a power cycle (in default behavior).
7. Second UART-to-USB bridge - this gives access to the console UART for the Cortex-M4 core of the *iMX RT1176* MCU.

Figure 10 in chapter 3 gives a slightly more detailed presentation of all interfaces and connectors on the board.

2.3 Connecting - Get Started

It is recommended to visit the Getting Started with uCOM Developer's Kit landing page:

<https://www.embeddedartists.com/getting-started-with-ucom-developers-kit/>

2.3.1 Console

Begin by connecting the micro-B USB connector to position 1) in Figure 1 above. Connect the other end of the USB cable to the PC.

Meanwhile the PC will typically install a driver automatically for the UART-to-USB bridge that creates a Virtual COM port, if it is not already installed. If you have problems the drivers can be downloaded from the links below:

<http://www.ftdichip.com/Drivers/VCP.htm>

<http://www.ftdichip.com/Support/Documents/InstallGuides.htm>

When the driver has been installed, a new COM port will be listed under "Ports" in the Device Manager as shown in Figure 2. Please note that the actual port number will most likely be different on your computer.

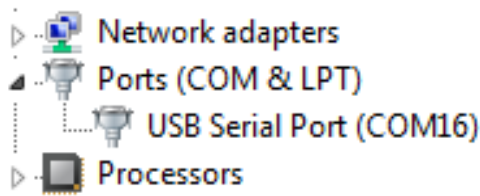


Figure 2 – Virtual COM port shown in device manager

The next step is to open a terminal application and attach it to the Virtual COM port that has just been created. The baud rate should be **115200**.

Some development environments/IDEs have a built-in terminal application that can be used. Sometimes it is better to have a terminal application with more features. For increased flexibility, we recommend using any of the two alternative terminal applications presented in the following subsections.

2.3.2 Tera Term Terminal Emulation Application

We recommend that you use **Tera Term** which can be downloaded and installed from either of the links below.

<https://tssh2.osdn.jp/index.html.en>

<http://sourceforge.jp/projects/tssh2/releases/>

Launch *Tera Term*. The first time it launches, it will show you the following dialog. Select the serial option. Assuming the USB cable is connected to the *uCOM Carrier Board*, there should be a COM port automatically populated in the list.

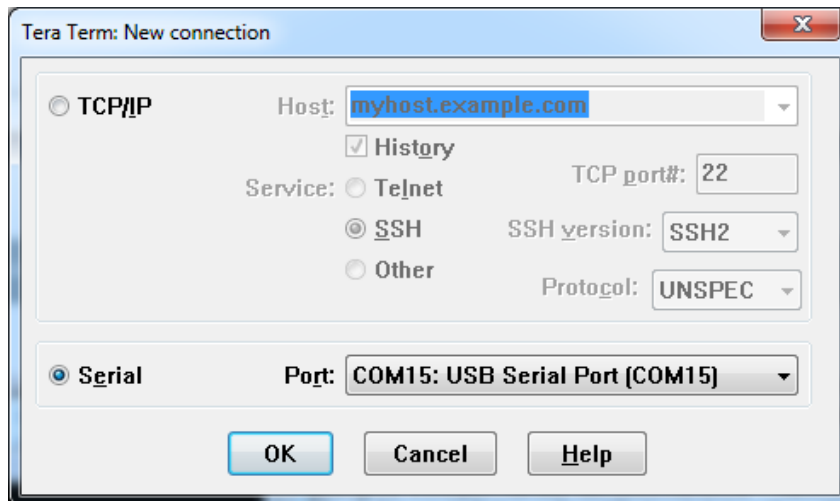


Figure 3 – Tera Term New Connection Window

Configure the serial port settings (using the COM port number identified earlier) to 115200 baud rate, 8 data bits, no parity and 1 stop bit. To do this, go to Setup → Serial Port and change the settings.

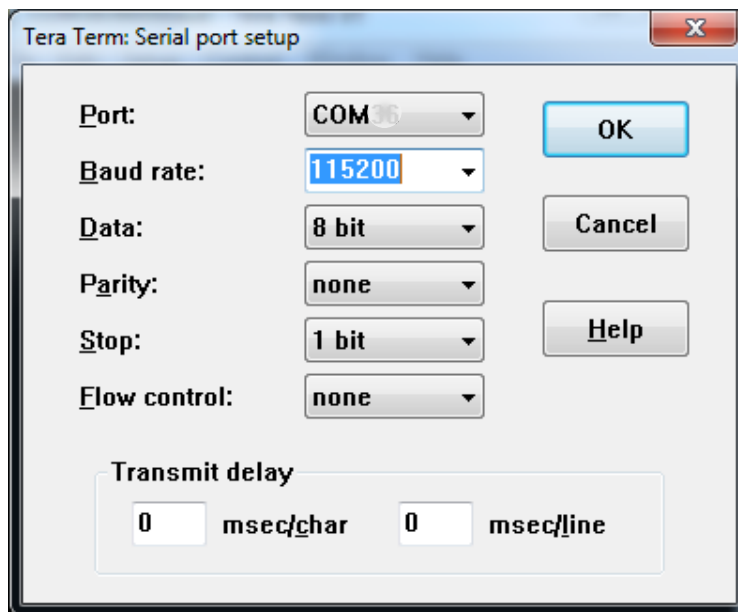


Figure 4 – Tera Term Serial Port Setup

Verify that the connection is open. If connected, *Tera Term* will show something like below in its title bar.

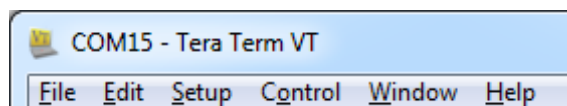


Figure 5 – Tera Term Menu

2.3.3 PuTTY terminal emulation application

Alternatively you can use **PuTTY**. It is another commonly used terminal emulation application. PuTTY can be downloaded and installed from the link below.

<http://www.chiark.greenend.org.uk/~sgtatham/putty/download.html>

Launch PuTTY by either double clicking on the *.exe file you downloaded or from the Start menu, depending on the type of download you selected.

In the window that launches, select the Serial radio button and enter the COM port number that you determined earlier. Also enter the baud rate, in this case 115200.

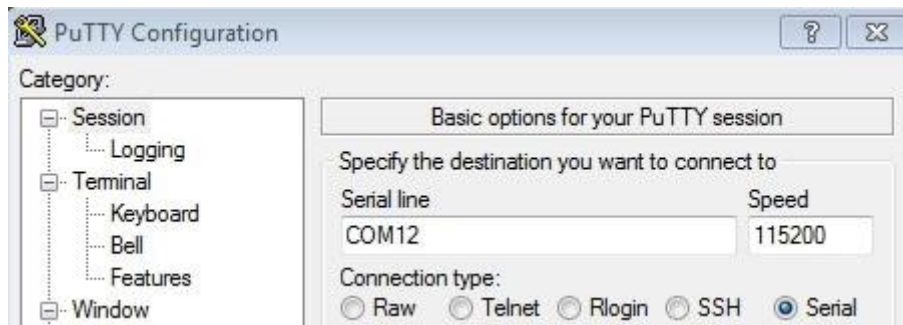


Figure 6 – PuTTY New Session Configuration

Click Open to open the serial connection. Assuming the FTDI cable is connected and you entered the correct COM port, the terminal window will open. If the configuration is not correct, PuTTY will alert you.

2.3.4 Powering

The 12V power supply comes with plug adapters for different countries. Select the plug used in your country and attach it to the power supply. Connect the 2.1mm male barrel jack to the *uCOM Carrier board* (2 in the picture below).

Set the Power on/off switch (1 in the picture) to On state and the board will now power up.

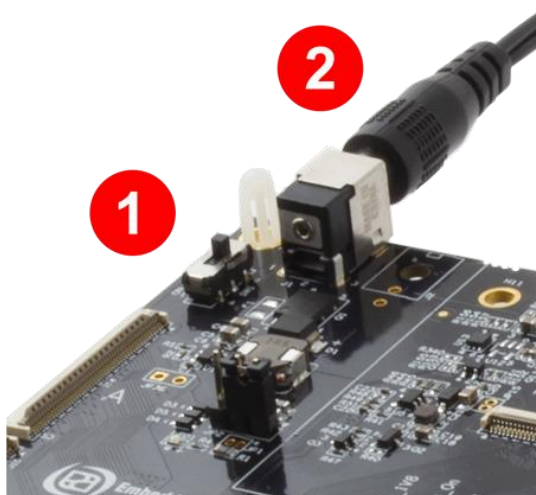


Figure 7 – 12V Power Supply input

2.3.5 Console output

The pre-loaded demo application will output a greeting message on the console. Verify that you can see this text in the terminal application.

2.4 Alternative Powering

The board is normally powered from the 12V input supply voltage. The board can also be powered via the console USB interfaces, J29 and J30. Power selector JP2 must be placed in the 2-3 position for this alternative supply source.

Note that this setup will not always work because the power consumption of the entire board can be higher than what a PC/laptop can provide. This might also be true for a powered USB hub.

The 12V supply input is needed when running USB Host application that require powering external USB devices.

See Figure 8 below where to locate JP2 (rev A boards to the left and rev PB2 to the right).

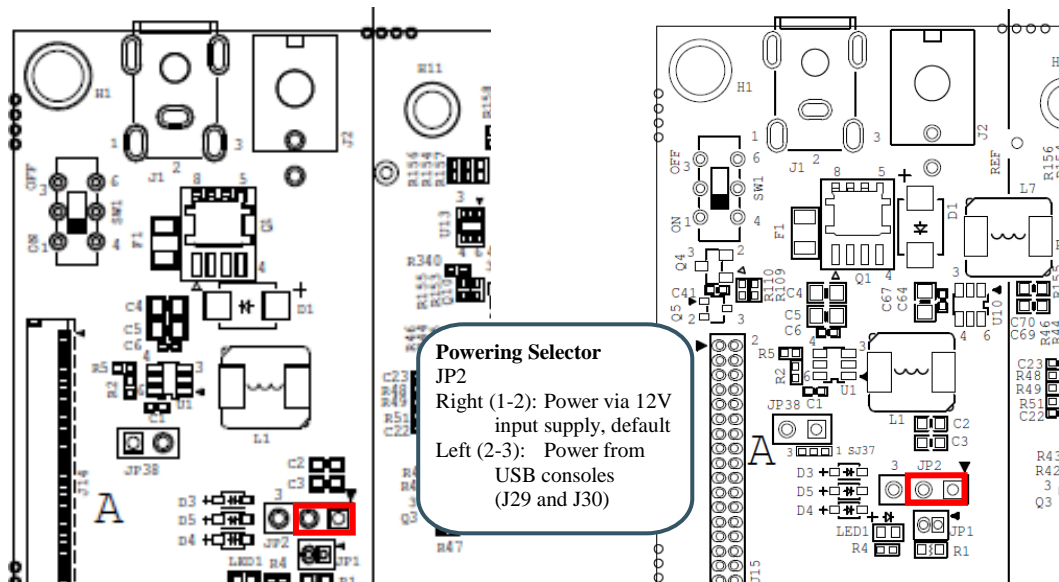


Figure 8 – Location of Powering Selector, JP2

2.5 ESD Precaution

Please note that the *iMX RT1176 uCOM Board* and *uCOM Carrier Board* come without any case/box and all components are exposed for finger touches – and therefore extra attention must be paid to ESD (electrostatic discharge) precaution.

Make it a habit always to first touch the metal surface of one of the USB, SD or Ethernet connectors for a few seconds with both hands before touching any other parts of the boards. That way, you will have the same potential as the board and therefore minimize the risk for ESD.

Never touch directly on the *iMX RT1176 uCOM Board* and in general as little as possible on the *uCOM Carrier Board*. The push-buttons on the *uCOM Carrier Board* have grounded shields to minimize the effect of ESD.

Note that Embedded Artists does not replace boards that have been damaged by ESD.



2.6 Note uCOM Orientation when Mounting

Normally, the iMX RT1176 uCOM board should never be removed/unmounted from the uCOM Carrier Board. If it has been removed and it's time to mount it again, note that it is possible to mount the uCOM board with incorrect orientation. Doing that will damage the uCOM board beyond repair and can also damage the carrier board. The picture below illustrates how to identify the correct orientation of the iMX RT1176 uCOM.

Always match the "A" and "B" marking on the uCOM with the "A" and "B" on the Carrier Board.

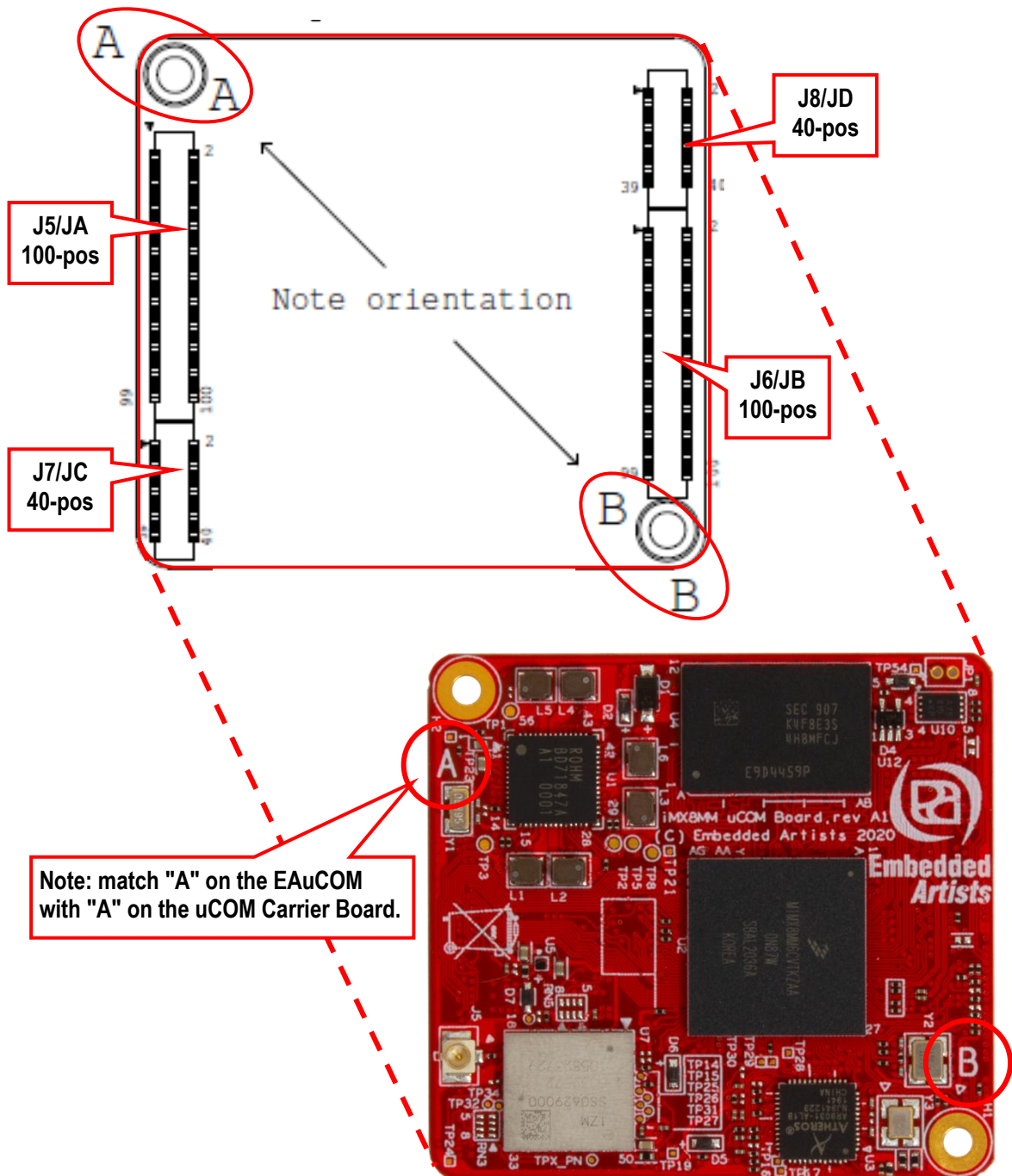


Figure 9 – Orientation of iMX RT1176 uCOM Board when Mounted on the uCOM Carrier Board

2.7 General Handling Care

Handle the *iMX RT1176 uCOM Board* and *uCOM Carrier Board* with care. The boards are not mounted in a protective case/box and are not designed for rough physical handling. Connectors can wear out after excessive use. The *uCOM Carrier Board* is designed for prototyping use, and not for integration into an end-product.

Also handle the *iMX RT1176 uCOM board* with great mechanical care. **Only remove/unmount it from the *uCOM Carrier board* if absolutely needed.** Only use small movements and small force. Do not insert a screwdriver between the uCOM board and *uCOM Carrier board* and bend without having first watched the Youtube clip we have published about this:

https://www.youtube.com/watch?v=-a1UGi_rLM, title "How to mount and unmount the uCOM board"

2.8 OTP Fuse Programming

The i.MX RT1176 MCU has on-chip OTP fuses that can be programmed, see NXP documents *IMXRT1170RM*, *i.MX RT1170 Processor Reference Manual* for details. Once programmed, there is no possibility to reprogram them.

iMX RT1170 uCOM Boards are delivered with BT_FUSE_SEL = 1. No other OTP fuse has been programmed. It is completely up to the COM board user to decide if OTP fuses shall be programmed and in that case, which ones.

Just programming BT_FUSE_SEL = 1 will set the boot device to the on-board QSPI flash. It is possible to specify another boot mode by programming the BOOT_CFG1[7:0] and BOOT_CFG2[3:0] fuses.

Note that Embedded Artists does not replace iMX RT1176 uCOM Boards because of wrong OTP programming. It's the user's responsibility to be absolutely certain before OTP programming and not to program the fuses by accident.

2.9 CE Assessment

The *iMX RT1176 Developer's Kit* (consisting of the *iMX RT1176 uCOM Board* and *uCOM Carrier Board*) is CE marked. See separate *CE Declaration of Conformity* document.

The *iMX RT1176 Developer's Kit* is a class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

EMC emission test has been performed on the *iMX RT1176 Developer's Kit*. Standard interfaces like Ethernet, USB, serial have been in use. General expansion connectors where internal signals are made available (for example processor pins) have been left unconnected. Connecting other devices to the product via the general expansion connectors may alter EMC emission. It is the user's responsibility to make sure EMC emission limits are not exceeded when connecting other devices to the general expansion connectors of the *iMX RT1176 Developer's Kit*.

Due to the nature of the *iMX RT1176 Developer's Kit* – an evaluation board not for integration into an end-product – fast transient immunity tests and conducted radio-frequency immunity tests have not been executed. Externally connected cables are assumed to be less than 3 meters. The general expansion connectors where internal signals are made available do not have any other ESD protection than from the chip themselves. Observe ESD precaution.

Note that the *iMX RT1176 uCOM board* is classified as a component and is hence not CE marked separately. It can perform different functions in different integrations and it does not have a direct function. It is therefore not in the scope of the CE Directive. An end product, where a *uCOM Board* is integration into, is however very likely to need CE marking.

3 uCOM Carrier Board Design

There is a separate *uCOM Carrier Board datasheet* that covers peripherals, general design and features of the *uCOM Carrier Board*. There is also a separate document on how to set the jumpers in the default state for the *iMX RT1176 Developer's Kit*. The *uCOM Carrier Board* schematic can be downloaded in pdf format and is recommended to be available when working with the *iMX RT1176 Developer's Kit*.

The picture below gives an overview of the *uCOM Carrier Board* design. Note that there are different revisions of the design but at the overview level they are all the same.

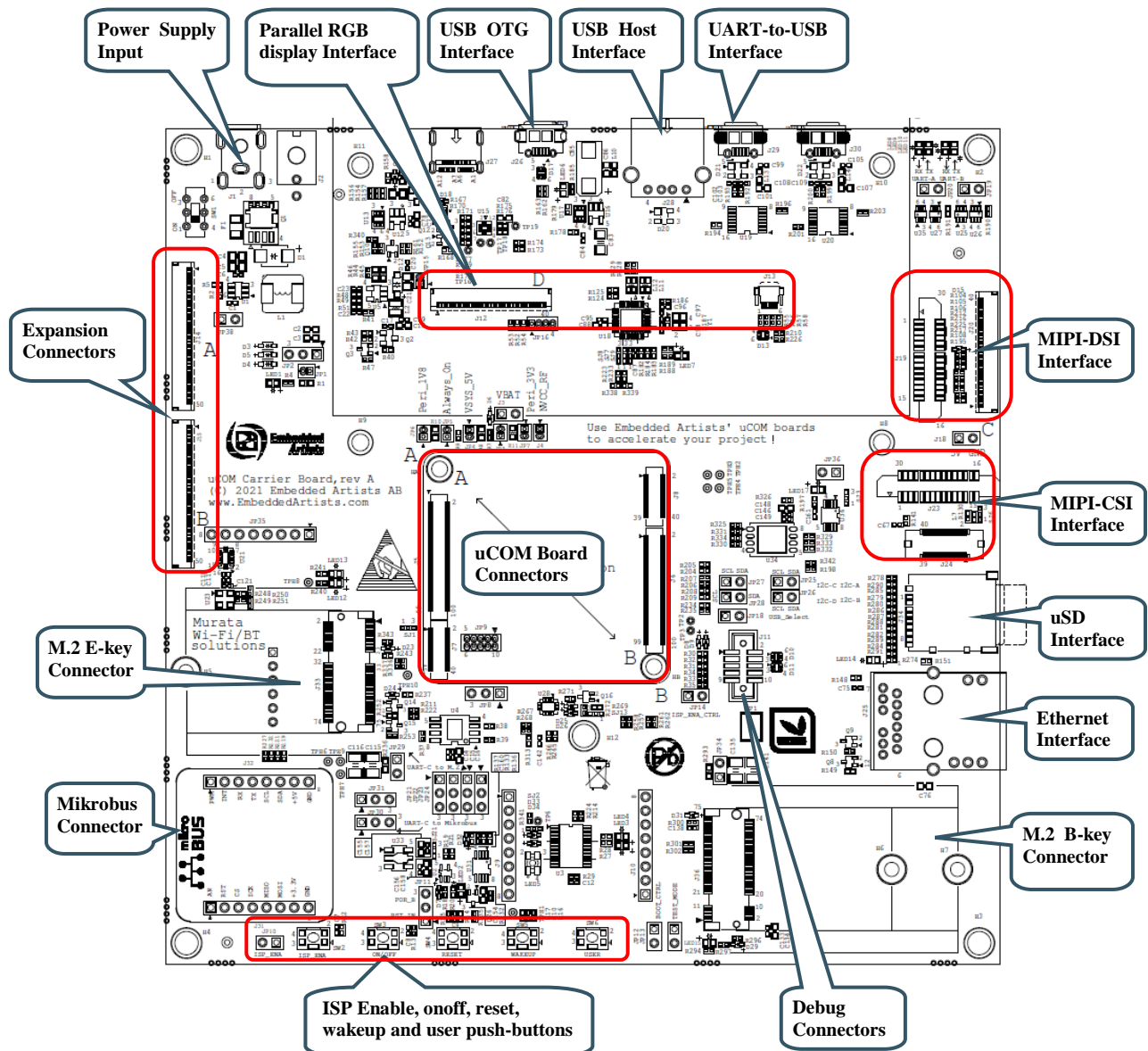


Figure 10 – Overview of uCOM Carrier Board

The *uCOM Carrier Board datasheet* contains information about how to connect the 100/10Mbps Ethernet Adapter, the MIPI-DSI to HDMI Adapter and the RK055HDMIPI4M display (NXP's 5.5 inch 720x1280 pixel LCD in portrait mode with direct MIPI-DSI interface).

3.1 Ethernet Interface Adapter

There is a 100/10Mbps Ethernet Adapter for the i.MX RT1176 uCOM boards. It is based on the KSZ8081RNB Ethernet-Phy. The adapter also includes the 24AA025E48T-I/OT I2C-E2PROM with an EUI-48 (MAC address) number. The Ethernet connector, J16, is HY931168C from Hanrun, or equivalent.

The picture below illustrates how the Ethernet adapter is connected to J12. Note that J12 is the parallel RGB display interface connector. It is identified on the uCOM Carrier Board with a "D". It is not possible to connect a parallel RGB LCD while the Ethernet adapter is connected. They are mutually exclusive.

Note that there are two 40-pos FPC connectors on the Ethernet adapter, J17 and J37. J17 is the connector closest to the PCB edge and J37 is the other connector (inside the PCB). **Use the J37 connector for the iMX RT1176 uCOM board.** Do not use J17, the inner connector (it is for the iMX RT1064 uCOM board). Note that four jumper cables are also needed to connect the adapter.

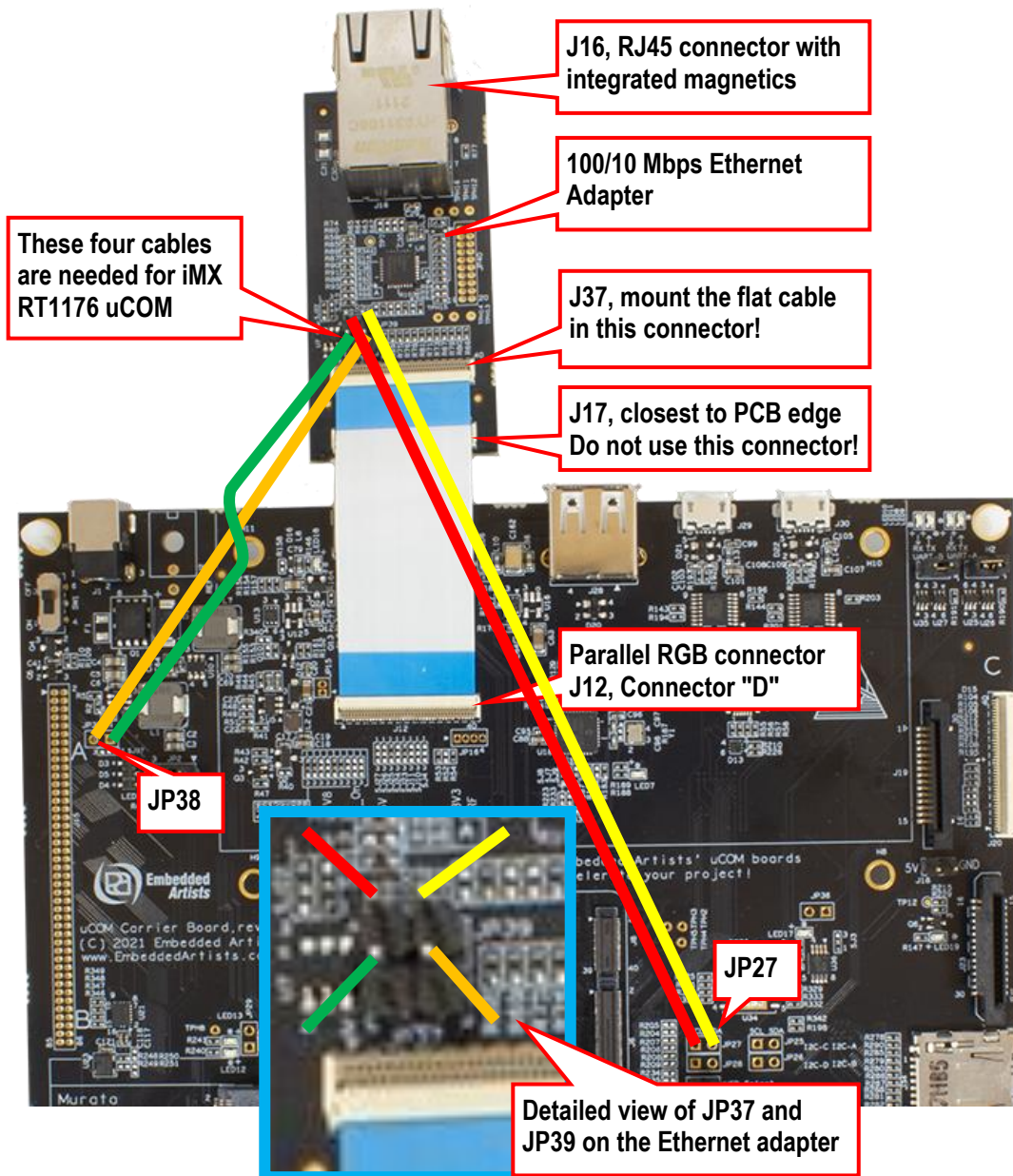


Figure 11 – uCOM Carrier Board rev PB2, Ethernet Interface Adapter

4 Disclaimers

Embedded Artists reserves the right to make changes to information published in this document, including, without limitation, specifications and product descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof.

Customer is responsible for the design and operation of their applications and products using Embedded Artists' products, and Embedded Artists accepts no liability for any assistance with applications or customer product design. It is customer's sole responsibility to determine whether the Embedded Artists' product is suitable and fit for the customer's applications and products planned, as well as for the planned application and use of customer's third party customer(s). Customers should provide appropriate design and operating safeguards to minimize the risks associated with their applications and products. Customer is required to have expertise in electrical engineering and computer engineering for the installation and use of Embedded Artists' products.

Embedded Artists does not accept any liability related to any default, damage, costs or problem which is based on any weakness or default in the customer's applications or products, or the application or use by customer's third party customer(s). Customer is responsible for doing all necessary testing for the customer's applications and products using Embedded Artists' products in order to avoid a default of the applications and the products or of the application or use by customer's third party customer(s). Embedded Artists does not accept any liability in this respect.

Embedded Artists does not accept any liability for errata on individual components. Customer is responsible to make sure all errata published by the manufacturer of each component are taken note of. The manufacturer's advice should be followed.

Embedded Artists does not accept any liability and no warranty is given for any unexpected software behavior due to deficient components.

Customer is required to take note of manufacturer's specification of used components, for example MCU, SDRAM and FLASH. Such specifications, if applicable, contains additional information that must be taken note of for the safe and reliable operation. These documents are stored on Embedded Artists' product support page.

All Embedded Artists' products are sold pursuant to Embedded Artists' terms and conditions of sale: http://www.embeddedartists.com/sites/default/files/docs/General_Terms_and_Conditions.pdf

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted under this document. If any part of this document refers to any third party products or services it shall not be deemed a license grant by Embedded Artists for the use of such third party products or services, or any intellectual property contained therein or considered as a warranty covering the use in any manner whatsoever of such third party products or services or any intellectual property contained therein.

UNLESS OTHERWISE SET FORTH IN EMBEDDED ARTISTS' TERMS AND CONDITIONS OF SALE EMBEDDED ARTISTS DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY WITH RESPECT TO THE USE AND/OR SALE OF EMBEDDED ARTISTS PRODUCTS INCLUDING WITHOUT LIMITATION IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION), OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT.

UNLESS EXPRESSLY APPROVED IN WRITING BY THE CEO OF EMBEDDED ARTISTS, PRODUCTS ARE NOT RECOMMENDED, AUTHORIZED OR WARRANTED FOR USE IN MILITARY, AIR CRAFT, SPACE, NUCLEAR, LIFE SAVING, OR LIFE SUSTAINING APPLICATIONS, NOR IN PRODUCTS OR SYSTEMS WHERE FAILURE OR MALFUNCTION MAY RESULT IN PERSONAL INJURY, DEATH, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE.

Resale of Embedded Artists' products with provisions different from the statements and/or technical features set forth in this document shall immediately void any warranty granted by Embedded Artists

for the Embedded Artists' product or service described herein and shall not create or extend in any manner whatsoever, any liability of Embedded Artists.

This document as well as the item(s) described herein may be subject to export control regulations. Export might require a prior authorization from national authorities.

4.1 Definition of Document Status

Preliminary – The document is a draft version only. The content is still under internal review and subject to formal approval, which may result in modifications or additions. Embedded Artists does not give any representations or warranties as to the accuracy or completeness of information included herein and shall have no liability for the consequences of use of such information. The document is in this state until the product has passed Embedded Artists product qualification tests.

Approved – The information and data provided define the specification of the product as agreed between Embedded Artists and its customer, unless Embedded Artists and customer have explicitly agreed otherwise in writing.