# RTKA720210DE0000BU

4-Port USB 3.0 Hub

## Description

The RTKA720210DE0000BU evaluation board (previously named ET-D720210-0001) is a 4-port USB 3.0 hub using the μPD720210K8-BAF-A USB 3.0 hub controller.

This hub expands four USB 3.0 ports from a PC's USB 3.x port. No specific driver is required for a common OS like Windows 11 and Linux based OS (e.g., Ubuntu).

## Specifications

- Compliant with Universal Serial Bus 3.0 Specification Revision 1.0
  - Supports Low-Speed (1.5Mbps), Full-Speed (12Mbps), Hi-Speed (480Mbps), and Superspeed (5Gbps)
  - Supports USB 3.0 link power management (U0/U1/U2/U3)
  - Supports USB 2.0 link power management (LPM: L0/L1/L2/L3)
- Supports Energy Star and EuP specifications for low-power PC peripheral system
- Certified by USB Implementers Forum
  - μPD720210: TID = 330000024

## Features

- 4-Port USB 3.0 hub
  - 4-Port USB 3.0 hub Controller: μPD720210K8-BAF-A
- Configurable downstream port counts of 2, 3, or 4 ports
- Self-Powered mode operating (Bus-Powered mode was omitted.)
- BC support:
  - SDP Only
- Power Supply:
  - 5V Power Supply
  - Switching Regulator for 3.3V from 5V input and for 1.05V from 5V input on board.
- VBUS control:
  - Individual overcurrent detection
  - Individual power control
- System clock: 24MHz crystal
- SPI ROM for optional firmware and parameter data

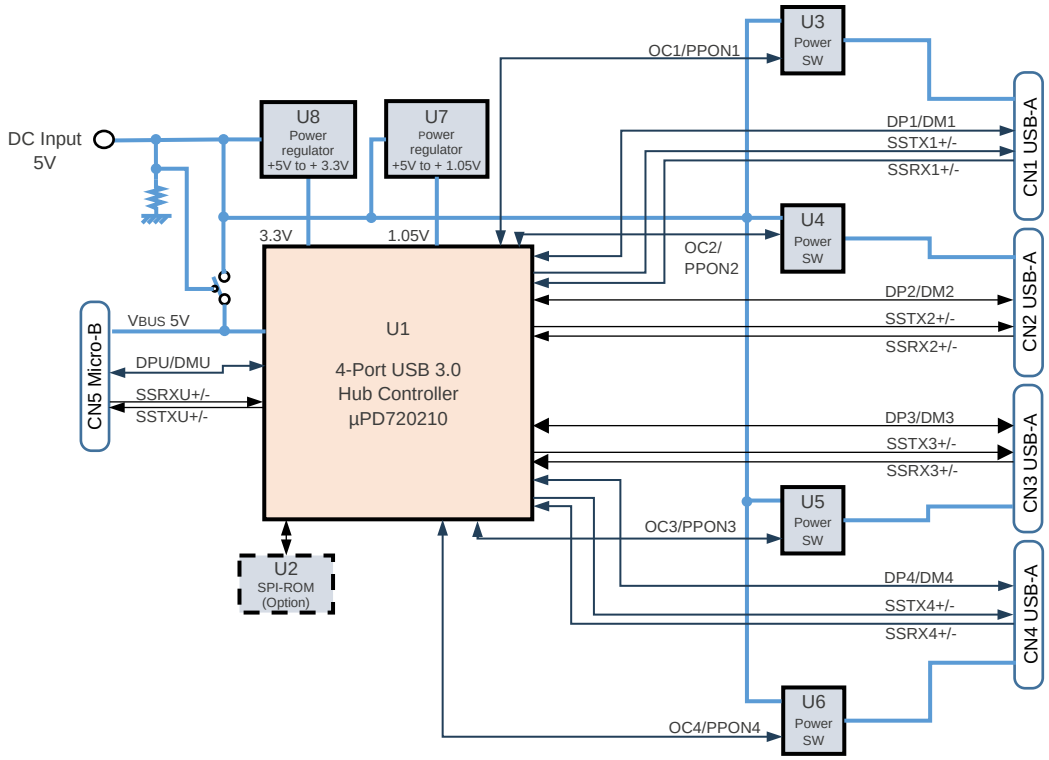


**Figure 1. Typical Application Circuit for 4-Port USB 3.0 Hub (RTKA720210DE0000BU)**

# Contents



# Figures

# 1. Related Documents

Use this document in combination with the following documents.

The related documents mentioned in this publication might include preliminary versions. However, the preliminary versions are not marked accordingly.

- µPD720210 Datasheet
- µPD720210 User's Manual
- µPD72021x External ROM Selection Guide

*Note*: Some documents and design information might contain the previous board name ET-D720210-0001, therefore, read ET-D720210-0001 as RTKA720210DE0000BU.

# 2. Functional Description

The evaluation board is a USB 3.0 hub that supports 4 USB 3.0 downstream ports. Major operating systems, such as Windows and Linux, include standard USB 3.0 drivers, so no specific drivers are required to evaluate this board with a PC system.

## 2.1 Required Equipment

- RTKA720210DE0000BU evaluation board: 1 unit
- USB-A to micro-B Cable: 1 unit
- AC Adapter: 1 unit

**Table 1. RTKA720210DE0000BU AC Adapter Specifications**

| | |
|---|---|
| **DC Output Voltage** | 5V |
| **Current Rating (Amps)** | 5A |
| **DC Power Connector** | |
| **Configuration** | The center contact is the output voltage |
| **Industry Recognized Mating Diameter** | 2.00mm ID (0.079"), 5.50mm OD (0.217") |
| **Actual Diameter** | 0.076" (1.93mm ID), 0.248" (6.30mm OD) |

***Important***: Use this board when you understand and agree that Renesas does not have any responsibility, indemnification, or liability for use of this board.

## 2.2 Required Environment

The RTKA720210DE0000BU evaluation board requires generic USB Hub driver to work, and it has been checked to work with the OS in the box driver for Windows / Linux OS as of 2023.

***Important***: Depending on the change of USB control method for both Windows/Linux OS, there is a possibility that the USB host/hub controller operation could be incorrect. Therefore, Renesas can not guarantee that our USB host controller works correctly with future drivers and environments.

The basic evaluation was performed with the following driver and environment:

- Windows 10 20H2 Build 19042 and Ubuntu 23, kernel v6.5.0 with Intel Core i5-6500 (code name: Skylake) on Asus H110M-K MB
- Windows server: Received certification on 2012 RTM, 2012 R2 RTM, and 2022
- Linux: Kylin Ubuntu 16 Kernel 4.9.23 and Ubuntu 18, kernel v5.10.0
- Windows 10 20H1 build 19041 and 21H1 Build 19043
- Windows 11

## 2.3 Quick Start Guide

The RTKA720210DE0000BU evaluation board allows easy evaluation of the Renesas USB 3.0 hub controllers using a PC system as noted in the following sections.

### 2.3.1 Connecting to a PC

At first, supply power to the RTKA720210DE0000BU by connecting a suitable AC adapter to the DC 5V jack. Connect the Micro-B connector of the RTKA720210DE0000BU to the USB-A connector of the PC system using a USB cable. Plug and play automatically begins.

### 2.3.2 Connecting to USB Peripherals

After connecting the RTKA720210DE0000BU to a PC system, plug and play is initiated when the USB-A connector of the RTKA720210DE0000BU is connected to the USB-B or Micro-B connector of a USB peripheral device with a USB cable.

## 2.4 Parameters in External ROM

The µPD720210 USB 3.0 Hub Controller has the extended capability to change the settings of the functions built into the controller. There are two ways of changing the settings of the functions: One method uses the pin strapping options, and the other uses the external ROM. Specifically, the following parameters can only be set with an external ROM and are used as default if there is no external ROM.

**Table 2. The Parameters for RTKA720210DE0000BU**

| Category | Item Name | Description | Default Value |
|---|---|---|---|
| **Device Descriptor** | **USB3.0** | | |
| | Vendor ID | Vendor ID | 045Bh |
| | Product ID | USB3.0 Hub Product ID | 0210h |
| | bcdDevice | USB3.0 Hub Device version | 0100h |
| | **USB2.0** | | |
| | Product ID | USB2.0 Hub Product ID | 0209h |
| **BC Mode** | PPOFF_MODE | Time delay before turning on VBUS when changing the BC mode | 0b (400 ms) |
| **Pin Usage Settings** | GPIO(SUSPEND/NRDCLKO) pin | SUSPEND/NRDCLKO pin function (Suspend output, or CLKOUT) | 0b (Suspend out) |
| | LED1B/SUSPEND pin | LED1B/SUSPEND pin function (None, or Suspend output) | 1b (None) |
| **Clock Output Function's Additional Settings** | Clock Output Control | NRDCLKO control (Unstoppable, or Controllable) | 1b (Unstoppable) |
| | Clock Output Frequency | NRDCLKO Frequency (12MHz, or 24MHz) | 0b (24MHz) |
| | Non-Removable-Device Type on Port 1 | Non-Removable Device Type (Hub, or other) | 0b (USB3Hub) |
| **Other Settings** | USB2.0 LPM Enable | USB 2.0 LPM Enable | 1b (Enabled) |
| | USB3.0 U2 Disable | USB 3.0 U2 line state disable | 0b (Normal) |
| | USB3.0 U1 Disable | USB 3.0 U1 line state disable | 0b (Normal) |

### 2.4.1 ROM Image Data Preparation

The RTKA720210DE0000BU evaluation board manual operates with the parameters stored in the external ROM that is programmed at the factory. This standard ROM Image Data for the RTKA720210DE0000BU evaluation board manual is available from Renesas.com.

For manufacturers planning to set other parameters for the µPD720210, a ROM writing tool for Windows is also available that generates ROM Image Data and writes it to an external ROM. Contact Renesas technical support for further assistance.

# 3. Board Design

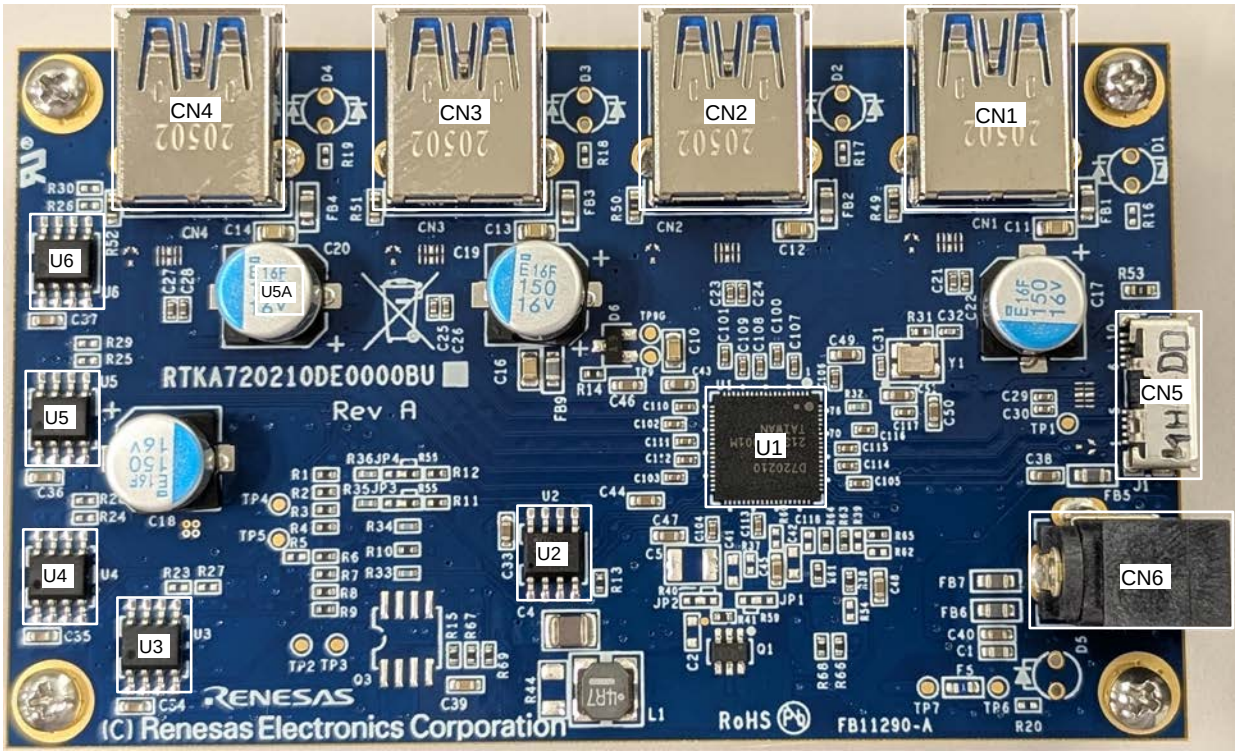


**Figure 2. Highlighted Main Parts on the RTKA720210DE0000BU Evaluation Board (Top)**

**Table 3. RTKA720210DE0000BU Evaluation Board Connectors**

| Label | Description |
|---|---|
| CN1 | USB-A receptacle for USB downstream facing Port 1 |
| CN2 | USB-A receptacle for USB downstream facing Port 2 |
| CN3 | USB-A receptacle for USB downstream facing Port 3 |
| CN4 | USB-A receptacle for USB downstream facing Port 4 |
| CN5 | Micro USB-B receptacle for USB upstream facing Port |
| CN6 | DC 5V jack |


**Figure 3. Highlighted Main Parts on the RTKA720210DE0000BU Evaluation Board (Bottom)**

**Table 4. RTKA720210DE0000BU Evaluation Board ICs**

| Label | Description |
|---|---|
| U1 | µPD720210 (4-Port USB 3.0 hub Controller) (see Figure 2) |
| U2 | SPI ROM (see Figure 2) |
| U3 | USB VBUS power switch for USB downstream facing Port 1 (see Figure 2) |
| U4 | USB VBUS power switch for USB downstream facing Port 2 (see Figure 2) |
| U5 | USB VBUS power switch for USB downstream facing Port 3 (see Figure 2) |
| U6 | USB VBUS power switch for USB downstream facing Port 4 (see Figure 2) |
| U7 | 5V to 1.05V Power regulator |
| U8 | 5V to 3.3V Power regulator |

## 3.1 Pin and Function Assignment for µPD720210

Table 5 shows the pin and function descriptions of the µPD720210 on the RTKA720210DE0000BU evaluation board.

**Table 5. Pin and Function Descriptions for µPD720210 on the RTKA720210DE0000BU Evaluation Board**

| Pin No. | Pin Name | Function | Descriptions |
|---|---|---|---|
| 1 | SUSPEND | Open | Unused |
| 2 | RESETB | RESET | Chip Reset Input |
| 3 | U3TXDP1 | DFP_TX+ | TX+ signaling for USB 3.0 Downstream Facing Port 1 |
| 4 | U3TXDN1 | DFP_TX- | TX- signaling for USB 3.0 Downstream Facing Port 1 |
| 5 | VDD10 | VDD10 | Power supply (+1.05V) for Core Logic |
| 6 | U3RXDP1 | DFP_RX+ | RX+ signaling for USB 3.0 Downstream Facing Port 1 |
| 7 | U3RXDN1 | DFP_RX- | RX- signaling for USB 3.0 Downstream Facing Port 1 |

| Pin No. | Pin Name | Function | Descriptions |
|---|---|---|---|
| 8 | VDD33 | VDD33 | Power supply (+3.3V) |
| 9 | U2DP1 | DFP_D+ | DP signaling for USB 2.0 Downstream Facing Port 1 |
| 10 | U2DM1 | DFP_D- | DM signaling for USB 2.0 Downstream Facing Port 1 |
| 11 | VDD10 | VDD10 | Power supply (+1.05V) for Core Logic |
| 12 | U3TXDP2 | DFP_TX+ | TX+ signaling for USB 3.0 Downstream Facing Port 2 |
| 13 | U3TXDN2 | DFP_TX- | TX- signaling for USB 3.0 Downstream Facing Port 2 |
| 14 | VDD10 | VDD10 | Power supply (+1.05V) for Core Logic |
| 15 | U3RXDP2 | DFP_RX+ | RX+ signaling for USB 3.0 Downstream Facing Port 2 |
| 16 | U3RXDN2 | DFP_RX- | RX- signaling for USB 3.0 Downstream Facing Port 2 |
| 17 | VDD33 | VDD33 | Power supply (+3.3V) |
| 18 | U2DP2 | DFP_D+ | DP signaling for USB 2.0 Downstream Facing Port 2 |
| 19 | U2DM2 | DFP_D- | DM signaling for USB 2.0 Downstream Facing Port 2 |
| 20 | U3TXDP3 | DFP_TX+ | TX+ signaling for USB 3.0 Downstream Facing Port 3 |
| 21 | U3TXDN3 | DFP_TX- | TX- signaling for USB 3.0 Downstream Facing Port 3 |
| 22 | VDD10 | VDD10 | Power supply (+1.05V) for Core Logic |
| 23 | U3RXDP3 | DFP_RX+ | RX+ signaling for USB 3.0 Downstream Facing Port 3 |
| 24 | U3RXDN3 | DFP_RX- | RX- signaling for USB 3.0 Downstream Facing Port 3 |
| 25 | VDD33 | VDD33 | Power supply (+3.3V) |
| 26 | U2DP3 | DFP_D+ | DP signaling for USB 2.0 Downstream Facing Port 3 |
| 27 | U2DM3 | DFP_D- | DM signaling for USB 2.0 Downstream Facing Port 3 |
| 28 | VDD10 | VDD10 | Power supply (+1.05V) for Core Logic |
| 29 | U3TXDP4 | DFP_TX+ | TX+ signaling for USB 3.0 Downstream Facing Port 4 |
| 30 | U3TXDN4 | DFP_TX- | TX- signaling for USB 3.0 Downstream Facing Port 4 |
| 31 | VDD10 | VDD10 | Power supply (+1.05V) for Core Logic |
| 32 | U3RXDP4 | DFP_RX+ | RX+ signaling for USB 3.0 Downstream Facing Port 4 |
| 33 | U3RXDN4 | DFP_RX- | RX- signaling for USB 3.0 Downstream Facing Port 4 |
| 34 | VDD33 | VDD33 | Power supply (+3.3V) |
| 35 | U2DP4 | DFP_D+ | DP signaling for USB 2.0 Downstream Facing Port 4 |
| 36 | U2DM4 | DFP_D- | DM signaling for USB 2.0 Downstream Facing Port 4 |
| 37 | LED1B | Open | Unused |
| 38 | SPICSB | Pull-up | Connected to VDD33 to use External serial ROM. |
| 39 | SPISI | SPISI | Connected to Seral Data input pin of External ROM. |
| 40 | SPISO | SPISO | Connected to Seral Data output pin of External ROM. |
| 41 | SPISCK | SPISCL | Connected to Seral Clock input pin of External ROM. |
| 42 | VDD33 | VDD33 | Power supply (+3.3V) |
| 43 | VBUSM | VBUSM | Upstream Port VBUS Monitor |
| 44 | BUSSEL | MODE | Power Mode Select (Self-powered) |
| 45 | OCI1B | OCI | Over Current Input for USB Downstream Facing Port 1 |
| 46 | PPON1B | PPON | Port Power Control for USB Downstream Facing Port 1 |

| Pin No. | Pin Name | Function | Descriptions |
|---|---|---|---|
| 47 | VDD10 | VDD10 | Power supply (+1.05V) for Core Logic |
| 48 | V33OUT | VDD33 | SW Regulator 3.3 V Output |
| 49 | V50IN | VDD5 | SW Regulator 5 V Input |
| 50 | AVDD33R | AVDD33 | SW Regulator 3.3 V Input |
| 51 | PGDRV | Open | Unused |
| 52 | NGDRV | Open | Unused |
| 53 | ILIM | VDD10 | SW Regulator Current Sense for 1.05V line |
| 54 | V10FB | VDD10 | SW Regulator 1.05V output monitor |
| 55 | OCI2B | OCI | Over Current Input for USB Downstream Facing Port 2 |
| 56 | PPON2B | PPON | Port Power Control for USB Downstream Facing Port 2 |
| 57 | OCI3B | OCI | Over Current Input for USB Downstream Facing Port 3 |
| 58 | PPON3B | PPON | Port Power Control for USB Downstream Facing Port 3 |
| 59 | OCI4B | OCI | Over Current Input for USB Downstream Facing Port 4 |
| 60 | PPON4B | PPON | Port Power Control for USB Downstream Facing Port 4 |
| 61 | VDD33 | VDD33 | Power supply (+3.3V) |
| 62 | U2DPU | UFP_D+ | DP signaling for USB 2.0 Upstream Facing Port |
| 63 | U2DMU | UFP_D- | DM signaling for USB 2.0 Upstream Facing Port |
| 64 | VDD10 | VDD10 | Power supply (+1.05V) for Core Logic |
| 65 | U3TXDNU | UFP_TX- | TX- signaling for USB 3.0 Upstream Facing Port |
| 66 | U3TXDPU | UFP_TX+ | TX+ signaling for USB 3.0 Upstream Facing Port |
| 67 | VDD10 | VDD10 | Power supply (+1.05V) for Core Logic |
| 68 | U3RXDNU | UFP_RX- | RX- signaling for USB 3.0 Upstream Facing Port |
| 69 | U3RXDPU | UFP_RX+ | RX+ signaling for USB 3.0 Upstream Facing Port |
| 70 | VDD10 | VDD10 | Power supply (+1.05V) for Core Logic |
| 71 | AVDD33 | AVDD33 | Power supply (+3.3V) for Analog circuit |
| 72 | RREF | RREF | Reference Voltage Input for USB 2.0 |
| 73 | IC(L) | Pull-down | Unused |
| 74 | XT1 | XTI | 24MHz External Oscillator Input |
| 75 | XT2 | XTO | 24MHz External Oscillator Output |
| 76 | VDD33 | VDD33 | Power supply (+3.3V) |
| GND PAD | GND | GND | Ground |

## 3.2 Schematic Diagrams

For the schematic diagram (PDF) and DSN file, see the RTKA720210DE0000BU 4-Port USB 3.0 Hub Design Files.

## 3.3 Bill of Materials

For the Bill of Materials (BOM), see the RTKA720210DE0000BU 4-Port USB 3.0 Hub Design Files.

## 3.4 Board Layout

For the Gerber files and BRD file, see the RTKA720210DE0000BU 4-Port USB 3.0 Hub Design Files.

# 4. Ordering Information

| Part Number | Description |
|---|---|
| RTKA720210DE0000BU | 4-Port USB 3.0 Hub Evaluation Board |

# 5. Revision History

| Revision | Date | Description |
|---|---|---|
| 2.00 | Dec 10, 2025 | Reformatted document to the latest template. |
| 1.00 | Jan 15, 2025 | Initial release. |

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