

# RX72T CPU Card

R12UZ0031EJ0100

Rev.1.00

## User's Manual

Feb. 21, 2019

### For Your Safety

Do not fail to read this manual before using the RX72T CPU card (RTK0EMX990C00000BJ) (the product).

- Follow the indications in this manual when using the product.
- This product is the option board of "24V Motor Control Evaluation System for RX23T (RTK0EM0006S01212BJ)". Please read "Warnings Regarding Use of the Product" of the 24V Motor Control Evaluation System for RX23T User's Manual, and use this product.
- Keep this manual near the product so you can refer to it whenever necessary.
- Transfer or sale of the product to third parties is prohibited without written approval.
- The purchaser or importer of the product is responsible for ensuring compliance with local regulations. In addition, the customer is responsible for ensuring that the product is handled correctly and safely, in accordance with the laws of the customer's country (region).
- All information contained in this manual represents information on products at the time of publication of this manual. Please note that the product data, specification, sales offices, contents of website, address, etc., are subject to change by Renesas Electronics Corporation without notice due to product improvements or other reasons. Please confirm the latest information on Renesas Electronics website.
- The manual for the product, and specification (the documents) are the tool that was developed for the function and performance evaluation of Renesas Electronics semiconductor device (Renesas Electronics device) mounted on the product, and not guarantee the same quality, function and performance.
- By purchasing the product or downloading the documents from Renesas Electronics website, the support services provided from Renesas Electronics is not guaranteed.

### Meaning of Notations

In this manual items related to the safe use of the product are indicated as described below.

The degree of injury to persons or damage to property that could result if the designated content in this manual is not followed is indicated as follows.

|                                                                                                    |                                                                                                                                         |
|----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
|  <b>Danger</b>  | Indicates content that, if not followed, could result in death or serious injury* <sup>1</sup> to the user, and which is highly urgent. |
|  <b>Warning</b> | Indicates content that, if not followed, could result in death or serious injury to the user.                                           |
|  <b>Caution</b> | Indicates content that, if not followed, could result in injury* <sup>2</sup> to persons or physical damage.* <sup>3</sup>              |

Note 1. Serious injury refers to conditions resulting in persistent after-effects and for which treatment would necessitate hospitalization or regular hospital visits, such as loss or impairment of eyesight, burns (high- or low-temperature), electric shock, bone fracture, or poisoning.

Note 2. Injury refers to conditions for which treatment would necessitate hospitalization or regular hospital visits.

Note 3. Physical damage refers to damage affecting the wider surroundings, such as the user's home or property.

Requirements related to the handling of the product are classified into the following categories.

- Marks indicating that an action is prohibited.

|                                                                                   |                                                                   |                                                                                   |                                                                                          |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
|  | <b>General Prohibition</b><br>The indicated action is prohibited. |  | <b>Example: Do Not Touch!</b><br>Touching the specified location could result in injury. |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|

- Marks indicating that an action is prohibited.

|                                                                                   |                                                                                       |                                                                                   |                                                                                                |
|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|
|  | <b>General Caution</b><br>Indicates a general need for caution that is not specified. |  | <b>Example: Caution – Hot!</b><br>Indicates the possibility of injury due to high temperature. |
|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|

- Marks directing that the specified action is required.

|                                                                                   |                                                                 |                                                                                   |                                                                                                                                     |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
|  | <b>General Instruction</b><br>The specified action is required. |  | <b>Example: Turn Off (Disconnect) Power Supply!</b><br>Instructs the user to turn off (disconnect) the power supply to the product. |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|

## Warnings Regarding Use of the Product

### ■ Danger Items

|  <b>Danger</b>                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <br><br> | <ul style="list-style-type: none"> <li>• The product should be used only by persons (users) having a thorough knowledge of electrical and mechanical components and systems, a full knowledge of the risks associated with handling them, and training in inverter motor control and handling motors, or equivalent skills. Users should be limited to persons who have carefully read the Caution Items contained in this manual.</li> <li>• Unlike typical equipment, the product has no protective case to ensure safety, and it contains moving parts and high-temperature components that could be dangerous. Do not touch the evaluation board or cables while power is being supplied.</li> <li>• Carefully check to make sure that there are no pieces of conductive materials or dust adhering to the board, connectors, and cables.</li> <li>• There are moving parts, driven by a motor. Do not touch the motor while power is being supplied.</li> <li>• Ensure that the motor is insulated and placed in a stable location before supplying power.</li> </ul> |
|                                                                                                                                                                                | <b>Do Not Connect Load to Motor!</b> <ul style="list-style-type: none"> <li>• This could cause fire, burns, or injury.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

## ■ Warning Items

|  <b>Warning</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|--------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                 | <b>Caution – Rotating Parts!</b> <ul style="list-style-type: none"> <li>The system includes a motor. Touching the rotating shaft could cause high-temperature burns or injury.</li> </ul>                                                                                                                                                                                                                                                                                                                                                               |
|                 | Always insert plugs, connectors, and cables securely, and confirm that they are fully inserted. <ul style="list-style-type: none"> <li>Incomplete connections could cause fire, burns, electric shock, or injury.</li> </ul>                                                                                                                                                                                                                                                                                                                            |
|                                                                                                  | Use the power supply apparatus specified in the manual. <ul style="list-style-type: none"> <li>Failure to do so could cause fire, burns, electric shock, injury, or malfunction.</li> </ul>                                                                                                                                                                                                                                                                                                                                                             |
|                                                                                                  | Disconnect the power supply and unplug all cables when the system will not be used for a period of time or when moving the system. <ul style="list-style-type: none"> <li>Failure to do so could cause fire, burns, electric shock, or malfunction.</li> <li>This will protect the system against damage due to lightning.</li> </ul>                                                                                                                                                                                                                   |
|                                                                                                  | Use a mechanism (switch, outlet, etc.) located within reach to turn off (disconnect) the power supply. <ul style="list-style-type: none"> <li>In case of emergency, it may be necessary to cut off the power supply quickly.</li> </ul>                                                                                                                                                                                                                                                                                                                 |
|                 | Turn off the power supply immediately if you notice abnormal odor, smoke, abnormal sound, or overheating. <ul style="list-style-type: none"> <li>Continuing to use the system in an abnormal condition could cause fire, burns, or electric shock.</li> </ul>                                                                                                                                                                                                                                                                                           |
|               | <b>Do Not Disassemble, Modify, or Repair!</b> <ul style="list-style-type: none"> <li>Doing so could cause fire, burns, electric shock, injury, or malfunction.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                               |
|               | <b>Do not use the product for any purpose other than initial evaluation of motor control in a testing room or lab. Do not integrate the product or any part of it into other equipment. Do not insert or remove cables or connectors when the product is powered on.</b> <ul style="list-style-type: none"> <li>The product has no safety case.</li> <li>Failure to observe the above could cause fire, electric shock, burns, or malfunction.</li> <li>The product may not perform as expected if used for other than its intended purpose.</li> </ul> |

## ■ Caution Items

|  <b>Caution</b> |                                                                                                                                                                                             |
|----------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                 | <b>Caution – Hot!</b> <ul style="list-style-type: none"> <li>The motor gets hot. Touching it could cause high-temperature burns.</li> </ul>                                                 |
|                 | Follow the procedure specified in the manual when powering the system on or off. <ul style="list-style-type: none"> <li>Failure to do so could cause overheating or malfunction.</li> </ul> |
|                 | <b>Caution – Static Electricity</b> <ul style="list-style-type: none"> <li>Use the antistatic band. Failure to do so could cause malfunction or unstable motion.</li> </ul>                 |

## Overview

The RX72T CPU card (RTK0EMX990C00000BJ) is an optional board for use with the 24V Motor Control Evaluation System for RX23T (RTK0EM0006S01212BJ) (the Motor RSSK). The Motor RSSK comprises a 24V system inverter board (RTK0EM0001B00012BJ) (the INV-BRD) and a RX23T CPU card (RTK0EM0013C01201BJ) (the RX23T-CRD). By replacing the RX23T-CRD with the product, motor evaluation can be performed using the RX72T.

An emulator and equipment related to the Motor RSSK must be provided by the customer.

This user's manual describes the proper handling of the product. Content related to the product is presented in chapters 0 to 4 and 6 to 8. Content related to connection of the INV-BRD supplied with the Motor RSSK is presented in chapter 5. For details of the operation of the INV-BRD, refer to the Motor RSSK user's manual (R20UT3697EJ).

## Target Device

RX72T microcontroller

## Related Documents

- RX72T CPU Card Schematic : R12TU0057EJ
- RX72T CPU Card BOM List : R12TU0058EJ
- RX72T CPU Card PWB Pattern Drawing : R12TU0059EJ
- Renesas Solution Starter Kit  
24V Motor Control Evaluation System for RX23T (Motor RSSK) User's Manual: R20UT3697EJ

## Package Contents

- RX72T CPU Card Information
- Caution regarding the Motor Control Evaluation Board – RX72T CPU Card -

## Abbreviations

| Abbreviations | Full Name                                     | Remarks                                                                                                |
|---------------|-----------------------------------------------|--------------------------------------------------------------------------------------------------------|
| Motor RSSK    | 24V Motor Control Evaluation System for RX23T | Motor control evaluation kit for RX23T<br>Product No.: RTK0EM0006S01212BJ                              |
| INV-BRD       | 24V Inverter Board                            | Inverter board supplied with motor control evaluation kit for RX23T<br>Product No.: RTK0EM0001B00012BJ |
| RX23T-CRD     | RX23T CPU Card                                | RX23T CPU card supplied with motor control evaluation kit for RX23T<br>Product No.: RTK0EM0013C01201BJ |
| E1            | E1 emulator                                   | on-chip debugging emulator and flash programmer<br>Product No.: R0E000010KCE00                         |
| E2 Lite       | E2 emulator Lite                              | on-chip debugging emulator and flash programmer<br>Product No.: RTE0T0002LKCE00000R                    |

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## 1. Features

1. Populated with RX72T 32-bit microcontroller suitable for inverter control.
2. CPU card designed specifically for use with INV-BRD supplied with Motor RSK.
3. Supports writing of software to flash memory using the E1 or E2 Lite.
4. Equipped with Hall sensor input connector and encoder input connector.
5. Equipped with serial communication connector.

## 2. Specifications

### 2.1 Specification

Table 2-1 Overview of RX72T CPU Card Specifications

| Item                                                      |                              | Specification                                                                                                                                                                                                                                                                                                                                                                                                     |
|-----------------------------------------------------------|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Product name                                              |                              | RX72T CPU card                                                                                                                                                                                                                                                                                                                                                                                                    |
| Board product No.                                         |                              | RTK0EMX990C00000BJ                                                                                                                                                                                                                                                                                                                                                                                                |
| Supported inverter board / product No.                    |                              | Supplied with 24V Motor Control Evaluation System for RX23T<br>24V Inverter Board / RTK0EM0001B00012BJ                                                                                                                                                                                                                                                                                                            |
| Exterior view                                             |                              |                                                                                                                                                                                                                                                                                                                                 |
| Note: Appearance of actual product may differ from photo. |                              |                                                                                                                                                                                                                                                                                                                                                                                                                   |
| MCU                                                       | Product group                | RX72T group                                                                                                                                                                                                                                                                                                                                                                                                       |
|                                                           | Product No.                  | R5F572TKCDFB                                                                                                                                                                                                                                                                                                                                                                                                      |
|                                                           | CPU max. operating frequency | 200 MHz                                                                                                                                                                                                                                                                                                                                                                                                           |
|                                                           | Bit count                    | 32 bits                                                                                                                                                                                                                                                                                                                                                                                                           |
|                                                           | Package / Pin count          | LFQFP / 144 pins                                                                                                                                                                                                                                                                                                                                                                                                  |
|                                                           | ROM                          | 1MB                                                                                                                                                                                                                                                                                                                                                                                                               |
|                                                           | RAM                          | 128KB                                                                                                                                                                                                                                                                                                                                                                                                             |
| MCU input clock                                           |                              | 10MHz                                                                                                                                                                                                                                                                                                                                                                                                             |
| Input power supply voltage                                |                              | DC 5 V ( $\pm 5\%$ ) * <sup>1</sup><br>Selectable among the following: <ul style="list-style-type: none"> <li>• Power supply from supported inverter board</li> <li>• Power supply from E1, E2 Lite *<sup>2</sup></li> </ul>                                                                                                                                                                                      |
| Supported sensors                                         |                              | Hall sensor, encoder<br>(through holes provided for signal monitoring test pins)                                                                                                                                                                                                                                                                                                                                  |
| Supported emulator                                        |                              | E1, E2 Lite                                                                                                                                                                                                                                                                                                                                                                                                       |
| Connectors                                                |                              | <ul style="list-style-type: none"> <li>• Inverter board connectors x 2</li> <li>• Extender board connector x 2 (Unmounted)</li> <li>• SCI communication connectors x 3 (Two of them are unmounted)</li> <li>• CAN communication connector (Shared with SCI connector, unmounted)</li> <li>• Emulator connector</li> <li>• Hall sensor signal input connector</li> <li>• Encoder signal input connector</li> </ul> |
| Switch                                                    |                              | MCU external reset switch                                                                                                                                                                                                                                                                                                                                                                                         |
| LEDs                                                      |                              | User control LEDs x 2                                                                                                                                                                                                                                                                                                                                                                                             |
| Operating temperature                                     |                              | Room temperature                                                                                                                                                                                                                                                                                                                                                                                                  |
| Operating humidity                                        |                              | No condensation                                                                                                                                                                                                                                                                                                                                                                                                   |

Note 1. Supply voltage is DC 3.3V from E2 Lite.

Note 2. Power supply from E1 or E2 Lite is not supported when INV-BRD is connected.

## 2.2 Regulatory Compliance Notices

### 2.2.1 European Union regulatory notices

This product complies with the following EU Directives. (These directives are only valid in the European Union.)

CE Certifications:

- Electromagnetic Compatibility (EMC) Directive 2014/30/EU  
EN61326-1 : 2013 Class A

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**WARNING:** This is a Class A product. This equipment can cause radio frequency noise when used in the residential area. In such cases, the user/operator of the equipment may be required to take appropriate countermeasures under his responsibility.

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- Information for traceability
  - Authorised representative  
Name: Renesas Electronics Corporation  
Address: Toyosu Foresia, 3-2-24, Toyosu, Koto-ku, Tokyo 135-0061, Japan
  - Manufacturer  
Name: Renesas Electronics Corporation  
Address: Toyosu Foresia, 3-2-24, Toyosu, Koto-ku, Tokyo 135-0061, Japan
  - Person responsible for placing on the market  
Name: Renesas Electronics Europe GmbH  
Address: Arcadiastrasse 10, 40472 Dusseldorf, Germany
  - Trademark and Type name  
Trademark: Renesas  
Product name: RX72T CPU Card for Motor Control  
Type name: RTK0EMX990C00000BJ

Environmental Compliance and Certifications:

- Waste Electrical and Electronic Equipment (WEEE) Directive 2012/19/EU

### 3. Block Diagram

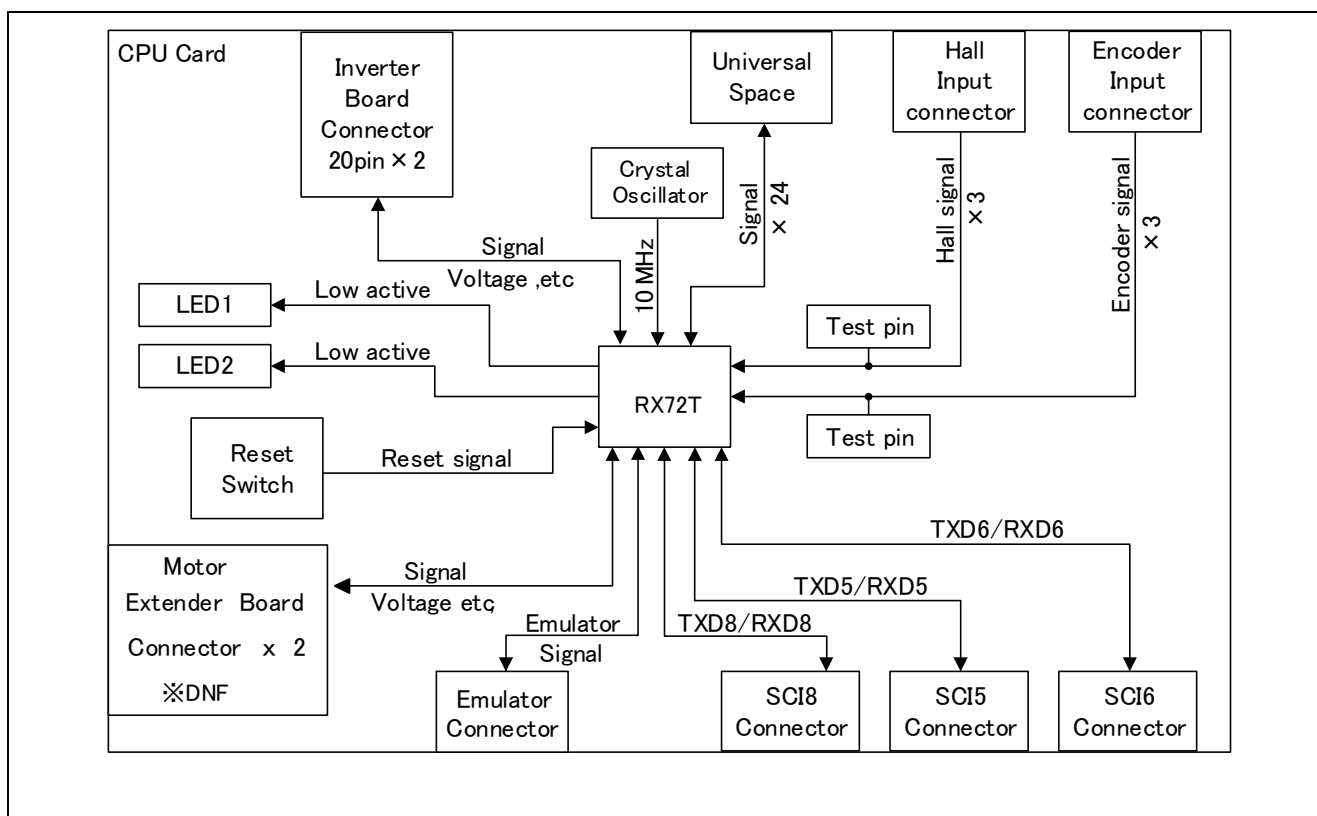


Figure 3.1 RX72T CPU Card Block Diagram

## 4. Layout

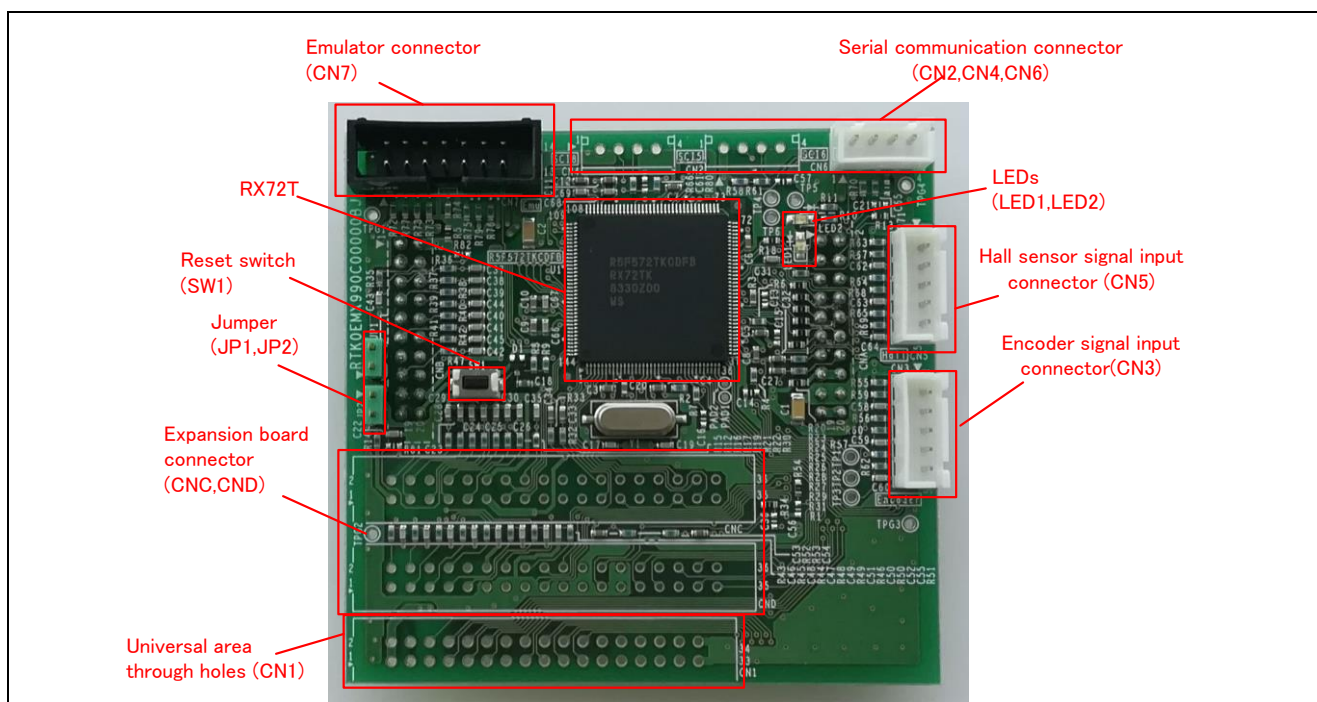


Figure 4.1 RX72T CPU Card Layout (Top View)

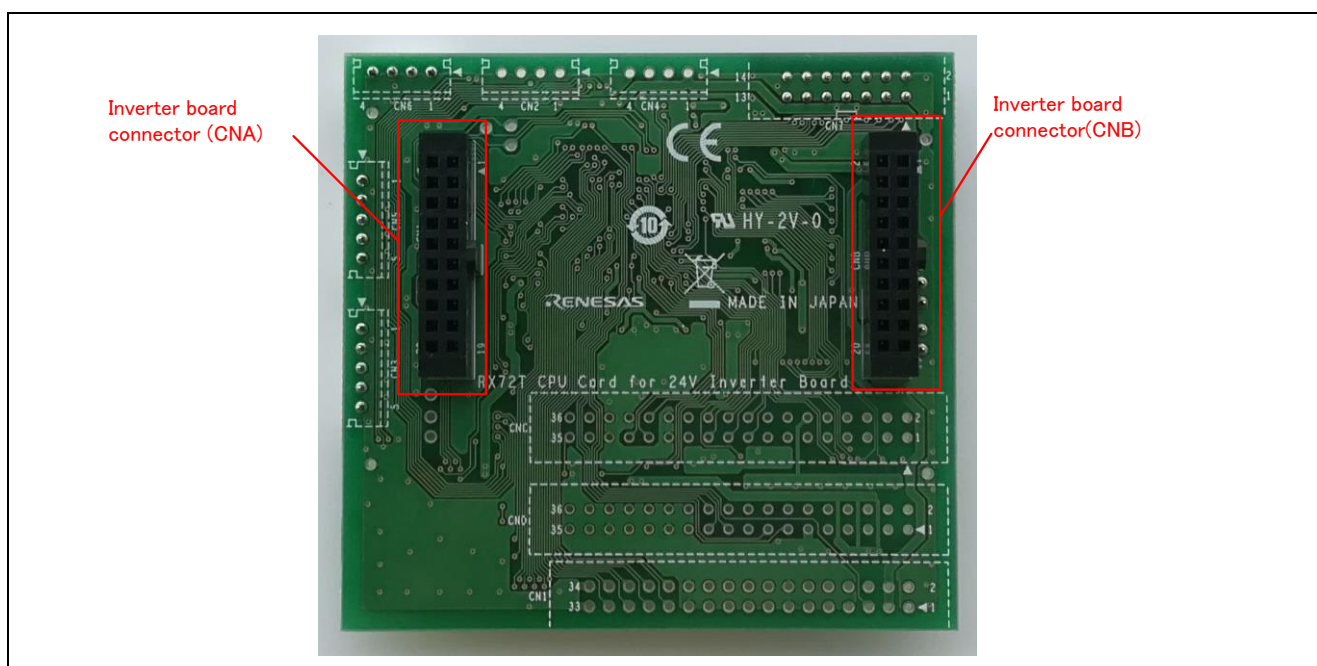


Figure 4.2 RX72T CPU Card Layout (Bottom View)

## 5. Usage

### 5.1 Quick Start

#### 5.1.1 Preparation

Obtain the Motor RSSK, and perform the steps described in 5.1.1 and 5.1.2, Quick Start, of the user's manual. (R20UT3697EJ).

#### 5.1.2 Replacing the CPU card

Confirm that the INV-BRD is powered off, remove the RX23T-CRD from the INV-BRD, and connect the product in its place.

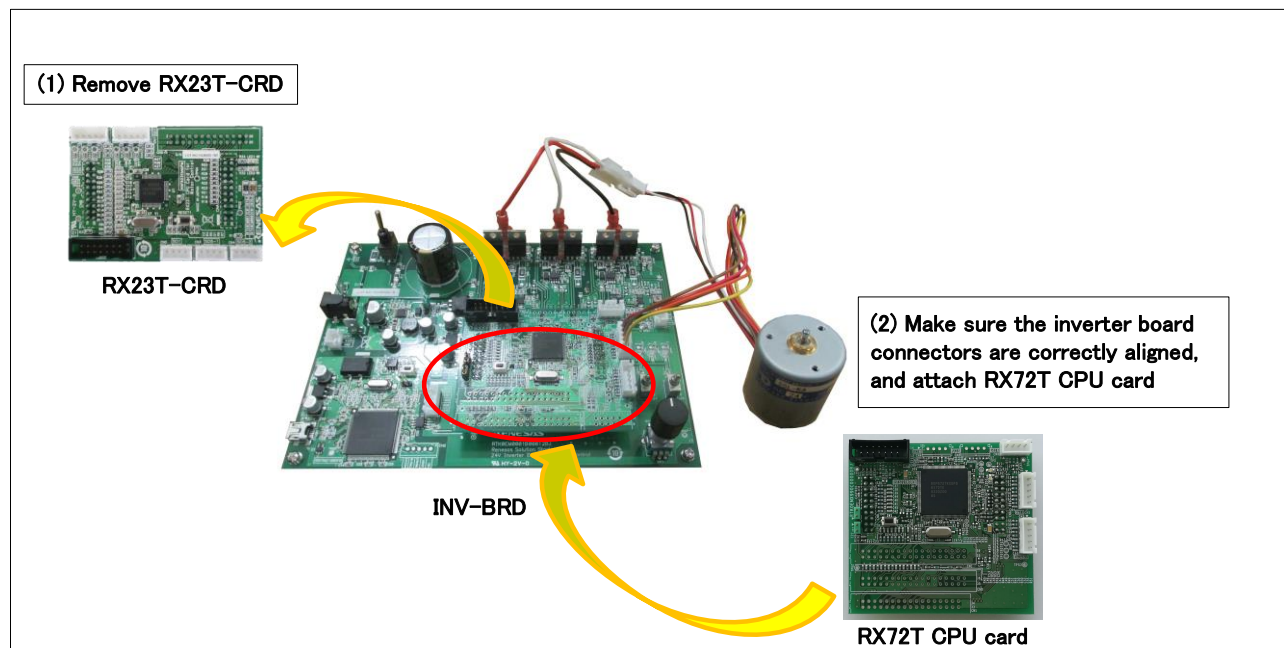


Figure 5.1 CPU card replacement

#### 5.1.3 Preparation for Operation Test

Perform the steps described in 5.1.3 to 5.1.5 of the Motor RSSK user's manual (R20UT3697EJ) to prepare for motor drive.

#### 5.1.4 Operation Test

Perform the steps described in 5.1.6 to 5.1.9 of the Motor RSSK user's manual (R20UT3697EJ) in the order indicated, turn on the power supply, enable motor rotation, change the motor rotation speed, and stop motor rotation.

#### 5.1.5 Finishing the Operation Test

After the operation test is finished, confirm that the motor shaft is no longer rotating and turn off the stabilized power supply output.

## 5.2 Operation

### 5.2.1 Basic Operation

Out of the box the product is programmed with sensor-less vector control software for the RX72T. Table 5-1 lists the software specifications and the basic operations when connected to the INV-BRD.

**Table 5-1 Initial Software Specifications**

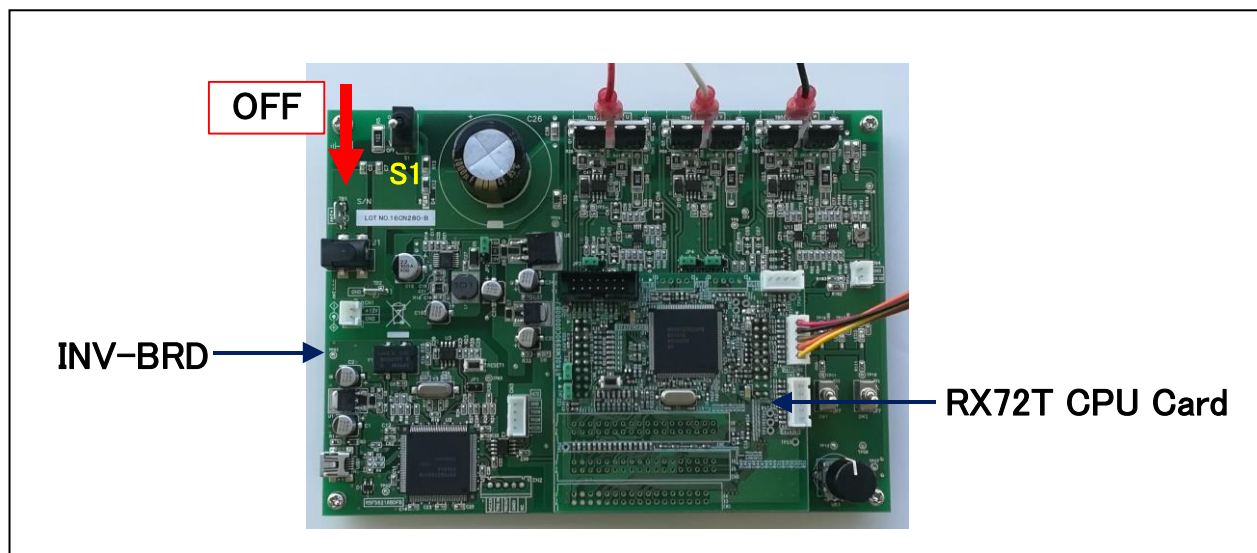
| Item           | Specification                                                                                                  |
|----------------|----------------------------------------------------------------------------------------------------------------|
| Control method | Sensorless vector control                                                                                      |
| VR1            | Clockwise turn: Motor shaft rotates clockwise.<br>Counterclockwise turn: Motor shaft rotates counterclockwise. |
| SW1            | ON: Motor rotation enabled<br>OFF: Motor rotation disabled                                                     |
| SW2            | Cancels error state: OFF → ON → OFF after an error:                                                            |
| LED1           | ON: SW1 ON and normal state.<br>OFF: SW1 OFF or error state.                                                   |
| LED2           | ON: error state.<br>OFF: normal state.                                                                         |

### 5.2.2 Canceling an Error State

If an error occurs, LED2 lights on the INV-BRD and the product, and motor rotation stops. To recover, it is necessary to turn off toggle switch SW1 and turn on toggle switch SW2 on the INV-BRD, and then turn off toggle switch SW2 again.

## 5.3 In Case of Abnormal Odor, Smoke, Abnormal Sound, Overheating, Etc.

The INV-BRD is equipped with a toggle switch (S1) to cut off the flow of current to the inverter. If an abnormal condition (such as abnormal odor, smoke, abnormal sound, or overheating) occurs, turn off S1 to cut off current flow to the inverter.



**Figure 5.2 Cut off current**

## 6. Functions

### 6.1 Power Supply

The product does not have a dedicated power supply connector. When connected to the INV-BRD it draws power via the connector. When not connected to the INV-BRD, it can draw power via the Emulator connector. The product is not allowed to draw power via the Emulator connector when it is connected to the INV-BRD.

### 6.2 Connecting the Emulator

The E1/E2 Lite on-chip debugging emulator from Renesas Electronics is used to write software (program) to the flash memory of the RX72T. Software will be downloaded into the product via E1 or E2 Lite. It is also necessary to make the settings shown in Table 6-1 in the integrated development environment to enable the emulator to supply power to the product. Table 6-2 lists the pin assignments of the Emulator connector.

**Table 6-1 E1, E2 Lite Power Supply Settings**

| Connection to INV-BRD | Power Supply Setting of E1, E2 Emulator |
|-----------------------|-----------------------------------------|
| Connected             | Power supply is not allowed*1           |
| Not connected         | 5.0V or 3.3V power supply               |

Note 1. When connected to the INV-BRD, the product must draw power from the INV-BRD.

**Table 6-2 Pin Assignments of Emulator Connector (CN7)**

| Pin No. | Pin Function | RX72T<br>Connection Pins | Pin No. | Pin Function | RX72T<br>Connection Pins |
|---------|--------------|--------------------------|---------|--------------|--------------------------|
| 1       | TCK/FINEC    | TCK/FINEC                | 2       | GND          | VSS/AVSS                 |
| 3       | TRST#        | TRST#                    | 4       | EMLE         | EMLE                     |
| 5       | TXD1/TDO     | PD3/TDO/TXD1             | 6       | NC           | -                        |
| 7       | MD/FINED     | MD/FINED                 | 8       | VCC          | VCC                      |
| 9       | TMS          | TMS                      | 10      | UB           | UB                       |
| 11      | TDI/RXD1     | PD5/TDI/RXD1             | 12      | GND          | VSS/AVSS                 |
| 13      | RESET#       | RES#                     | 14      | GND          | VSS/AVSS                 |

Note: See a supplement to the E1/E20/E2 emulator, E2 emulator Lite user's manual.

### 6.3 Connecting the Inverter Board

The product connects to the INV-BRD via the inverter board connectors (CNA and CNB). Table 6-3 and Table 6-4 list the pin assignments of the inverter board connectors.

**Table 6-3 Pin Assignments of Inverter Board Connector (CNA)**

| Pin No. | Pin Function | RX72T<br>Connection Pins | Pin No. | Pin Function | RX72T<br>Connection Pins |
|---------|--------------|--------------------------|---------|--------------|--------------------------|
| 1       | LED1#_1      | PC5                      | 2       | LED2#_1      | PC6                      |
| 3       | LED3#_1      | P34                      | 4       | NC           | PA1(unused)              |
| 5       | FO#          | P70/POE0#                | 6       | NC           | —                        |
| 7       | WN           | P76/MTIOC4D              | 8       | VN_1         | P75/MTIOC4C              |
| 9       | UN           | P74/MTIOC3D              | 10      | WP_1         | P73/MTIOC4B              |
| 11      | VP           | P72/MTIOC4A              | 12      | UP_1         | P71/MTIOC3B              |
| 13      | SW1#_1       | P35                      | 14      | SW2#_1       | PA0                      |
| 15      | 5V           | VCC                      | 16      | 5V           | VCC                      |
| 17      | GND          | VSS                      | 18      | GND          | VSS                      |
| 19      | 3.3V         | —                        | 20      | 3.3V         | —                        |

**Table 6-4 Pin Assignments of Inverter Board Connector (CNB)**

| Pin No. | Pin Function | RX72T<br>Connection Pins | Pin No. | Pin Function | RX72T<br>Connection Pins |
|---------|--------------|--------------------------|---------|--------------|--------------------------|
| 1       | AVCC         | AVCC                     | 2       | AVCC         | AVCC                     |
| 3       | NC           | —                        | 4       | PGAVSS_1     | PGAVSS0                  |
| 5       | IU_1         | P40/AN000                | 6       | IV_1         | P41/AN001                |
| 7       | IW_1         | P42/AN002                | 8       | VPN_1        | P63/AN209                |
| 9       | TEMP_1       | —                        | 10      | VU_1         | P60/AN206                |
| 11      | VV_1         | P61/AN207                | 12      | VW_1         | P62/AN208                |
| 13      | VAC_1        | —                        | 14      | IPFC_1       | —                        |
| 15      | VR_1         | P43/AN003                | 16      | VN_1         | —                        |
| 17      | VCCIO        | VCC                      | 18      | VCCIO        | VCC                      |
| 19      | GND          | VSS                      | 20      | GND          | VSS                      |

## 6.4 Connecting the Serial Communication

The product communicates with the UART via the serial communication connectors. There are three serial communication connectors: CN4, CN6, and CN7. Table 6-5 lists their pin assignments. Use CN6 when using a tool such as waveform display in conjunction with the INV-BRD.

**Table 6-5 Pin Assignments of Serial Communication Connectors (CN2, CN4, CN6)**

| Connector No. | Pin No. | Pin Function        | RX72T Connection Pins |
|---------------|---------|---------------------|-----------------------|
| CN2           | 1       | 5V                  | VCC                   |
| SCI5          | 2       | RX72T transmit side | PB5/TXD5/CTX0         |
| (DNF)         | 3       | RX72T receive side  | PB6/RXD5/CRX0         |
|               | 4       | GND                 | VSS                   |
| CN4           | 1       | 5V                  | VCC                   |
| SCI8          | 2       | RX72T transmit side | PC1/ TXD8             |
| (DNF)         | 3       | RX72T receive side  | PC0/ RXD8             |
|               | 4       | GND                 | VSS                   |
| CN6           | 1       | 5V                  | VCC                   |
| SCI6          | 2       | RX72T transmit side | PB0/TXD6              |
|               | 3       | RX72T receive side  | PB1/RXD6              |
|               | 4       | GND                 | VSS                   |

## 6.5 Hall Sensor Signal Input

The product is equipped with a Hall sensor signal input connector. Using this connector, it is possible to input the Hall sensor signal from the motor supplied with the Motor RSSK directly to the product. The signal input to the product is pulled up to 5 V and passed through an RC filter before being input to the RX72T. Table 6-6 lists the pin assignments of the Hall sensor signal input connector, and Table 6-7 lists connector information.

**Table 6-6 Pin Assignments of Hall Sensor Signal Input Connector (CN5)**

| Pin No. | Pin Function | RX72T Connection Pins |
|---------|--------------|-----------------------|
| 1       | 5V           | VCC                   |
| 2       | GND          | VSS                   |
| 3       | HALL_U_1     | P23/IRQ11             |
| 4       | HALL_V_1     | P24/IRQ4              |
| 5       | HALL_W_1     | P25/IRQ10             |

**Table 6-7 Hall Sensor Signal Input Connector Information**

| Part            | Product No. | Manufacturer         |
|-----------------|-------------|----------------------|
| Connector (CN5) | B5B-XH-A    | J.S.T. Mfg. Co. Ltd. |

## 6.6 Encoder Signal Input

The product is equipped with an encoder signal input connector. This makes it possible to input the encoder signal to the RX72T. The signal input to the product is pulled up to 5 V and passed through an RC filter before being input to the RX72T. Table 6-8 lists the pin assignments of the signal input connector, and Table 6-9 lists connector information.

**Table 6-8 Pin Assignments of Encoder Signal Input Connector (CN3)**

| Pin No. | Pin Function | RX72T Connection Pins |
|---------|--------------|-----------------------|
| 1       | 5V           | VCC                   |
| 2       | GND          | VSS                   |
| 3       | ENC_A_1      | PA7                   |
| 4       | ENC_B_1      | PA6                   |
| 5       | ENC_Z_1      | PA5                   |

**Table 6-9 Encoder Signal Input Connector Information**

| Part            | Product No. | Manufacturer         |
|-----------------|-------------|----------------------|
| Connector (CN3) | B5B-XH-A    | J.S.T. Mfg. Co. Ltd. |

## 6.7 Connecting the Extender Board

This product is equipped with two Extender board Connector. This connector can connect Extender Board (RTK0EM0000Z02000BJ) via the cable. This makes it possible to control three INV-BRDs. In other words, this product can drive three motors. Table 6-10 lists the pin assignments of the 2nd Extender board Connector.

Table 6-11 lists the pin assignments of the 3rd Extender board Connector. Note that the pin assignments of CND are different from those of CNC and that some pins of CND are pull-upped because of sharing the pins with CN7.

**Table. 6-10 Pin Assignments of 2nd Extender boards Connector**

| CNC<br>Pin No. | CNC<br>Pin Function | RX72T<br>Connection Pins | CNC<br>Pin No. | CNC<br>Pin Function | RX72T<br>Connection Pins |
|----------------|---------------------|--------------------------|----------------|---------------------|--------------------------|
| 1              | PGAVSS_2            | PGAVSS1                  | 2              | VPN_2               | P55/AN203                |
| 3              | IU_2                | P44/AN100                | 4              | IV_2                | P45/AN101                |
| 5              | IW_2                | P46/AN102                | 6              | TEMP_2              | —                        |
| 7              | VU_2                | P52/AN200                | 8              | VV_2                | P53/AN201                |
| 9              | VW_2                | P54/AN202                | 10             | VR_2                | —                        |
| 11             | GND                 | VSS                      | 12             | GND                 | AVSS                     |
| 13             | LED1#_2             | P15                      | 14             | LED2#_2             | P16                      |
| 15             | LED3#_2             | P17                      | 16             | FO#_2               | P01/POE12#               |
| 17             | WN_2                | P90/MTIOC7D              | 18             | VN_2                | P91/MTIOC7C              |
| 19             | UN_2                | P92/MTIOC6D              | 20             | WP_2                | P93/MTIOC7B              |
| 21             | VP_2                | P94/MTIOC7A              | 22             | UP_2                | P95/MTIOC6B              |
| 23             | SW1#_2              | P13                      | 24             | SW2#_2              | P14                      |
| 25             | GND                 | VSS                      | 26             | GND                 | VSS                      |
| 27             | ENC_A_2             | P31/MTCLKC               | 28             | ENC_B_2             | P30/MTCLKD               |
| 29             | ENC_Z_2             | PA3/MTIOC2A              | 30             | GND                 | VSS                      |
| 31             | GND                 | VSS                      | 32             | HALL_U_2            | PE5/IRQ0                 |
| 33             | HALL_V_2            | PE6/IRQ3                 | 34             | HALL_W_2            | P12/IRQ9                 |
| 35             | VRL_2               | P10(DNF)                 | 36             | NC                  | —                        |

Table 6. 6-11 Pin Assignments of 3rd Extender boards Connector

| CND<br>Pin No. | CND<br>Pin Function | RX72T<br>Connection Pins | CND<br>Pin No. | CND<br>Pin Function | RX72T<br>Connection Pins |
|----------------|---------------------|--------------------------|----------------|---------------------|--------------------------|
| 1              | PGAVSS_3            | —                        | 2              | VPN_3               | PH2/AN005                |
| 3              | IU_3                | PH1/AN004                | 4              | IV_3                | P47/AN103                |
| 5              | IW_3                | P50/AN204                | 6              | TEMP_3              | —                        |
| 7              | VU_3                | PH5/AN104                | 8              | VV_3                | PH6/AN105                |
| 9              | VW_3                | PH7/AN106                | 10             | VR_3                | —                        |
| 11             | GND                 | VSS                      | 12             | GND                 | AVSS                     |
| 13             | LED1#_3             | PF3                      | 14             | LED2#_3             | PE3                      |
| 15             | LED3#_3             | PB7                      | 16             | FO#_3               | PE4/POE10#               |
| 17             | WN_3                | PK1/GTIOC2B              | 18             | VN_3                | PG0/GTIOC1B              |
| 19             | UN_3                | PG2/GTIOC0B              | 20             | WP_3                | PK0/GTIOC2A              |
| 21             | VP_3                | PK2/GTIOC1A              | 22             | UP_3                | PG1/GTIOC0A              |
| 23             | SW1#_3              | PE0                      | 24             | SW2#_3              | PE1                      |
| 25             | GND                 | VSS                      | 26             | GND                 | VSS                      |
| 27             | ENC_A_3             | PD1/GTIOC3A              | 28             | ENC_B_3             | PD0/GTIOC3B              |
| 29             | ENC_Z_3             | PB4/GTETRGA              | 30             | GND                 | VSS                      |
| 31             | GND                 | VSS                      | 32             | HALL_U_3            | PF0/IRQ12                |
| 33             | HALL_V_3            | PF1/IRQ13                | 34             | HALL_W_3            | PF2/IRQ5                 |
| 36             | VRL_3               | PD2(DNF)                 | 36             | NC                  | —                        |

## 6.8 Extension of Unused Pins

To facilitate general use of the product, the unused pins of the RX72T are extended through universal connector through holes in the board. Table 6-12 lists the pin assignments of the universal area through holes.

**Table 6-12 Pin Assignments of Universal Area Through Holes (CN1)**

| Pin No. | RX72T Connection Pins | Pin No. | RX72T Connection Pins |
|---------|-----------------------|---------|-----------------------|
| 1       | UVCC                  | 2       | UVCC                  |
| 3       | AVCC                  | 4       | AVCC                  |
| 5       | PE2                   | 6       | P23                   |
| 7       | PB3                   | 8       | P27                   |
| 9       | PA4                   | 10      | GND                   |
| 11      | P96                   | 12      | P33                   |
| 13      | VSS                   | 14      | VSS                   |
| 15      | P32                   | 16      | P27                   |
| 17      | P26                   | 18      | P22                   |
| 19      | PC4                   | 20      | PC3                   |
| 21      | P21                   | 22      | P20                   |
| 23      | VSS                   | 24      | VSS                   |
| 25      | P65                   | 26      | P64                   |
| 27      | P51                   | 28      | PH3                   |
| 29      | P82                   | 30      | P81                   |
| 31      | P80                   | 32      | P11                   |
| 33      | VSS                   | 34      | VSS                   |

## 6.9 Reset Circuit

The product is equipped with a reset circuit for resetting the microcontroller at power-on reset and external reset. To apply an external reset to the microcontroller, press the pushbutton (SW1).

## 6.10 Crystal Resonator

This product is mounted crystal oscillator (Y1) on 8MHz.

## 6.11 LEDs

Two LEDs are mounted on the product for use in debugging programs and general system applications. Each turns on when the output on the corresponding port is low-level and turns off when the output is high-level. Table 6-13 lists the pin assignments corresponding to the LEDs.

**Table 6-13 RX72T CPU Card LED Connection Pin Assignments**

| Corresponding RX72T Port |                   | LED1 | LED2 |
|--------------------------|-------------------|------|------|
| PC5                      | High-level output | Off  | -    |
|                          | Low-level output  | On   | -    |
| PC6                      | High-level output | -    | Off  |
|                          | Low-level output  | -    | On   |

## 6.12 JP1, JP2

JP1 and JP2 should be short-circuited between 2-3Pin.

**Table 6-14 Jumper JP1 and JP2 configuration**

| JP1, JP2 configuration              | Function                                 |                                          |
|-------------------------------------|------------------------------------------|------------------------------------------|
|                                     | JP1                                      | JP2                                      |
| Open                                | Connect MCU (PGAVSS0 pin) to CNB (4 pin) | Connect MCU (PGAVSS1 pin) to CNC (1 pin) |
| <b>Short<br/>(Factory settings)</b> | Connect MCU (PGAVSS0 pin) to GND         | Connect MCU (PGAVSS1 pin) to GND         |

## 7. Details of RX72T CPU Card

### 7.1 RX72T Features

1. 32-bit microcontroller with RXv3 CPU core for motor control
2. On-chip 32-bit single-precision floating point unit (FPU)
3. Ability to output three-phase complementary PWM waveforms on three channels
4. Ability to set timer interrupt as A/D trigger
5. Three 12-bit A/D converter units with a total of 33 channels
6. Channel-dedicated sample and hold function
7. On-chip programmable gain amplifier and comparator
8. Timer output stop (Hi-Z) function
9. On-chip independent watchdog timer

## 7.2 RX72T Pin Assignments

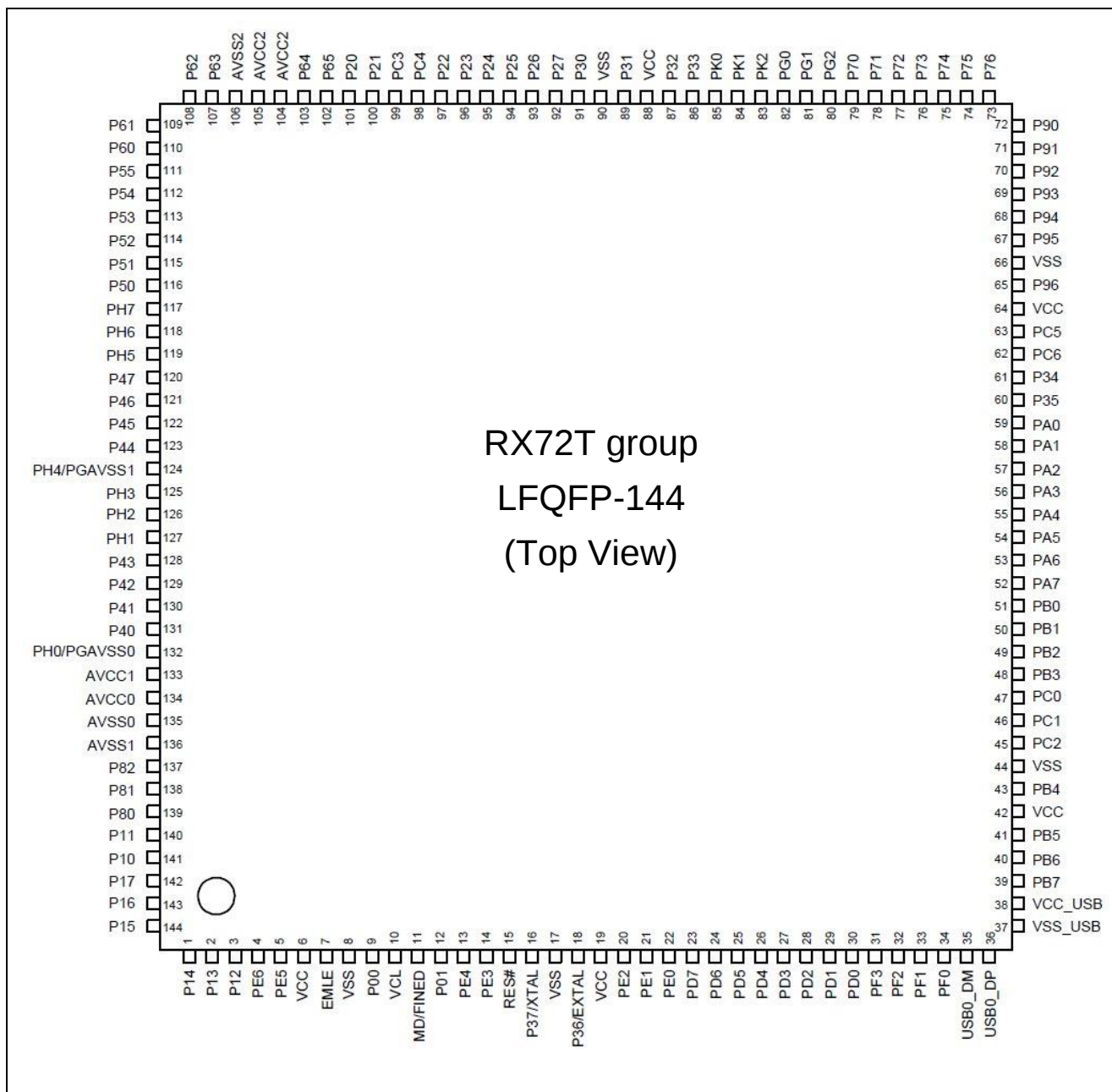


Figure 7.1 RX72T Pin Assignments

### 7.3 List of RX72T Pin Functions

Table 7-1 List of RX72T Pin Functions (1/5)

| Pin No. | RX72T Pin Functions                                                                                                                            | CPU Card Connection  | External Connection (N.C. : No connection) |
|---------|------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|--------------------------------------------|
| 1       | P14/MTIOC4B/MTIOC4B#/GTIOC2A/GTIOC9A/GTIOC2A#/GTIOC9A#/IRQ11                                                                                   | CNC-24               | SW2#_2                                     |
| 2       | P13/MTIOC4A/MTIOC4A#/GTIOC1A/GTIOC8A/GTIOC1A#/GTIOC8A#/IRQ10                                                                                   | CNC-23               | SW1#_2                                     |
| 3       | P12/MTIOC3B/MTIOC3B#/GTIOC0A/GTIOC7A/GTIOC0A#/GTIOC7A#/IRQ9                                                                                    | CNC-34               | HALL_W_2                                   |
| 4       | PE6/RD#/GTETRGA/GTETRGA#/GTETRGC/GTETRGC#/GTETRGC/POE10#/IRQ3                                                                                  | CNC-33               | HALL_V_2                                   |
| 5       | PE5/BCLK/MTIOC9D/MTIOC9D#/GTIOC3A/GTETRGA/GTIOC3A#/GTETRGC/SCK9/CTS9#/RTS9#/SS9#/IRQ0/ADST0                                                    | CNC-32               | HALL_U_2                                   |
| 6       | VCC                                                                                                                                            | VCC                  | VCC                                        |
| 7       | EMLE                                                                                                                                           | CN7-4                | E1, E2 Lite                                |
| 8       | VSS                                                                                                                                            | VSS                  | VSS                                        |
| 9       | UB/P00/A11/MTIOC9A/MTIOC9A#/CACREF/RXD9/SMISO9/SSCL9/RXD12/SMISO12/SSCL12/RXD12/IRQ2/ADST1/COMP0                                               | CN7-10               | E1, E2 Lite                                |
| 10      | VCL                                                                                                                                            | Connect to capacitor | -                                          |
| 11      | MD/FINED                                                                                                                                       | CN7-7                | E1, E2 Lite                                |
| 12      | P01/A10/MTIOC9C/MTIOC9C#/GTETRGA/GTETRGA#/GTETRGC/GTETRGC#/GTETRGC/POE12#/TXD9/SMOSI9/SSDA9/TXD12/SMOSI12/SSDA12/TXD12/SIOX12/IRQ4/ADST2/COMP1 | CNC-16               | FO#_2                                      |
| 13      | PE4/A9/MTCLKC/MTCLKC#/GTETRGA/GTETRGA#/GTETRGC/GTETRGC#/GTETRGC/POE10#/SCK9/IRQ1                                                               | CND-16               | FO#_3                                      |
| 14      | PE3/A8/MTCLKD/MTCLKD#/GTETRGA/GTETRGA#/GTETRGC/GTETRGC#/GTETRGC/POE11#/CTS9#/RTS9#/SS9#/IRQ2_DS                                                | CND-14               | LED2#_3                                    |
| 15      | RES#                                                                                                                                           | RESET, CN7-13        | MCU RESET                                  |
| 16      | XTAL/P37                                                                                                                                       | Crystal oscillator   | MCU oscillating                            |
| 17      | VSS                                                                                                                                            | VSS                  | VSS                                        |
| 18      | EXTAL/P36                                                                                                                                      | Crystal oscillator   | MCU oscillating                            |
| 19      | VCC                                                                                                                                            | VCC                  | VCC                                        |
| 20      | UPSEL/PE2/POE10#/NMI                                                                                                                           | CN1-5                | N.C                                        |
| 21      | PE1/WR0#/WR#/MTIOC9D/MTIOC9D#/TMO5/CTS5#/RTS5#/SS5#/CTS12#/RTS12#/SS12#/SSLA3/IRQ15                                                            | CND-24               | SW2#_3                                     |
| 22      | PE0/WR1#/BC1#/WAIT#/MTIOC9B/MTIOC9B#/TMCI1/TMCI1#/RXD5/SMISO5/SSCL5/SSLA2/CRX0/USB0_OV/RCURB/IRQ7                                              | CND-23               | SW1#_3                                     |
| 23      | TRST#/PD7/MTIOC9A/MTIOC9A#/GTIOC0A/GTIOC3A/GTIOC0A#/GTIOC3A#/TMRI1/TMRI5/TXD5/SMOSI5/SSDA5/SSLA1/CTX0/IRQ8                                     | CN7-3                | E1, E2 Lite                                |
| 24      | TMS/PD6/MTIOC9C/MTIOC9C#/GTIOC0B/GTIOC3B/GTIOC0B#/GTIOC3B#/TMO1/CTS1#/RTS1#/SS1#/CTS11#/RTS11#/SS11#/SSLA0/IRQ5/ADST0                          | CN7-9                | E1, E2 Lite                                |
| 25      | TDI/PD5/GTIOC1A/GTETRGA/GTIOC1A#/TMRI0/TMRI6/RXD1/SMISO1/SSCL1/RXD11/SMISO11/SSCL11/IRQ6                                                       | CN7-11               | E1, E2 Lite                                |
| 26      | TCK/FINEC/PD4/GTIOC1B/GTETRGA/GTIOC1B#/TMCI0/TMCI6/SCK1/SCK11/IRQ2                                                                             | CN7-1                | E1, E2 Lite                                |
| 27      | TDO/PD3/GTIOC2A/GTETRGC/GTIOC2A#/TMO0/TXD1/SMOSI1/SSDA1/TXD11/SMOSI11/SSDA11                                                                   | CN7-5                | E1, E2 Lite                                |

Table 7-2 List of RX72T Pin Functions (2/5)

|    |                                                                                                                           |        |                    |
|----|---------------------------------------------------------------------------------------------------------------------------|--------|--------------------|
| 28 | TRCLK/PD2/A7/GTIOC2B/GTIOC0A/GTIOC2B#/GTIOC0A#/TMC11/TMO4/SCK5/SCK8/MOSIA/USB0_VBUS                                       | CND-35 | VRL_3(unused)      |
| 29 | TRDATA3/PD1/A6/GTIOC3A/GTIOC0B/GTIOC3A#/GTIOC0B#/TMO2/RXD8/SMISO8/SSCL8/MISOA                                             | CND-27 | ENC_A_3            |
| 30 | TRDATA2/PD0/A5/GTIOC3B/GTIOC1A/GTIOC3B#/GTIOC1A#/TMO6/TXD8/SMOSI8/SSDA8/RSPCKA                                            | CND-28 | ENC_B_3            |
| 31 | TRDATA7/PF3/A19/CS3#/GTETRGA/TMO7/CTS11#/RTS11#/SS11#/CRX0/IRQ14/COMP0                                                    | CND-13 | LED1#_3            |
| 32 | TRDATA6/PF2/A18/CS2#/GTETRGA/TMO3/SCK11/CTX0/IRQ5/COMP1                                                                   | CND-34 | HALL_W_3           |
| 33 | TRDATA5/PF1/A17/CS1#/GTETRGC/TMO5/RXD11/SMISO11/SSCL11/IRQ13/COMP2                                                        | CND-33 | HALL_V_3           |
| 34 | TRDATA4/PF0/A0/BC0#/GTETRGD/TMO1/TXD11/SMOSI11/SSDA11/IRQ12/COMP3                                                         | CND-32 | HALL_U_3           |
| 35 | USB0_DM                                                                                                                   | -      | N.C                |
| 36 | USB0_DP                                                                                                                   | -      | N.C                |
| 37 | VSS_USB                                                                                                                   | VSS    | VSS                |
| 38 | VCC_USB                                                                                                                   | VCC    | VCC                |
| 39 | TRDATA1/PB7/A4/GTIOC1B/GTIOC1B#/SCK5/SCK11/SCK12/USB0_OVRCURB                                                             | CND-15 | LED3#_3            |
| 40 | TRDATA0/PB6/A3/GTIOC2A/GTIOC2A#/RXD5/SMISO5/SSCL5/RXD11/SMISO11/SSCL11/RXD12/SMISO12/SSCL12/RXD12/CRX0/USB0_OVRCURA/IRQ2  | CN2-3  | SCI5 communication |
| 41 | TRSYNC/PB5/A2/GTIOC2B/GTIOC2B#/TXD5/SMOSI5/SSDA5/TXD11/SMOSI11/SSDA11/TXD12/SMOSI12/SSDA12/TXD12/SIOX12/CTX0/USB0_VBUSEN  | CN2-2  | SCI5 communication |
| 42 | VCC                                                                                                                       | VCC    | VCC                |
| 43 | TRSYNC1/PB4/A1/GTETRGA/GTETRGA/GTETRGC/GTETRGC/POE8#/CTS5#/RTS5#/SS5#/SCK11/CTS11#/RTS11#/SS11#/USB0_OVRCURB/IRQ3_DS      | CND-29 | ENC_Z_3            |
| 44 | VSS                                                                                                                       | VSS    | VSS                |
| 45 | PC2/CS1#/MTIOC0D/MTIOC0D#/GTADSM0/SCK8/USB0_ID/USB0_OVRCURA/IRQ15/ADSM0/COMP5                                             | CN1-6  | N.C                |
| 46 | PC1/A16/MTIOC0C/MTIOC0C#/GTADSM1/TXD8/SMOSI8/SSDA8/USB0_EXICEN/USB0_VBUSEN/IRQ13/ADSM1/COMP4                              | CN4-2  | SCI8 communication |
| 47 | PC0/CS0#/MTIOC0B/MTIOC0B#/RXD8/SMISO8/SSCL8/USB0_VBUS/IRQ12/COMP3                                                         | CN4-3  | SCI8 communication |
| 48 | PB3/A7/MTIOC0A/MTIOC0A#/CACREF/SCK6/RSPCKA/IRQ9                                                                           | CN1-7  | N.C                |
| 49 | PB2/A6/MTIOC0B/MTIOC0B#/GTADSM0/TMRI0/TXD6/SMOSI6/SSDA6/SDA/ADSM0                                                         | CN1-8  | N.C                |
| 50 | PB1/A5/MTIOC0C/MTIOC0C#/GTADSM1/TMC10/RXD6/SMISO6/SSCL6/SCL/IRQ4/ADSM1                                                    | CN6-3  | SCI6 communication |
| 51 | PB0/A0/BC0#/A4/MTIOC0D/MTIOC0D#/TMO0/TXD6/SMOSI6/SSDA6/CTS11#/RTS11#/SS11#/MOSIA/IRQ8/ADTRG2#                             | CN6-2  | SCI6 communication |
| 52 | PA7/A15/MTCLKA/MTCLKC/MTCLKA#/MTCLKC#/GTADSM0/TMO2/RXD11/SMISO11/SSCL11/RXD12/SMISO12/SSCL12/RXD12/CRX0/ADSM0             | CN3-3  | ENC_A_1            |
| 53 | PA6/A14/MTCLKB/MTCLKD/MTCLKB#/MTCLKD#/GTADSM1/TMO6/TXD11/SMOSI11/SSDA11/TXD12/SMOSI12/SSDA12/TXD12/SIOX12/CTX0/IRQ7/ADSM1 | CN3-4  | ENC_B_1            |
| 54 | PA5/A3/MTIOC1A/MTIOC1A#/TMC13/RXD6/SMISO6/SSCL6/RXD8/SMISO8/SSCL8/MISOA/IRQ1/ADTRG1#                                      | CN3-5  | ENC_Z_1            |

Table 7-3 List of RX72T Pin Functions (3/5)

|    |                                                                                                                      |        |               |
|----|----------------------------------------------------------------------------------------------------------------------|--------|---------------|
| 55 | PA4/A2/MTIOC1B/MTIOC1B#/TMC17/SCK6/TXD8/SMOSI8/SSDA8/RSPCKA/ADTRG0#                                                  | CN1-9  | N.C           |
| 56 | PA3/A1/MTIOC2A/MTIOC2A#/GTADSM0/TMRI7/TXD9/SMOSI9/SSDA9/SCK8/SSLA0                                                   | CNC-29 | ENC_Z_2       |
| 57 | PA2/A0/BC0#/MTIOC2B/TIOC2B#/GTADSM1/TMO7/CTS6#/RTS6#/SS6#/RXD9/SMISO9/SSCL9/SCK11/SSLA1                              | CN1-10 | N.C           |
| 58 | PA1/MTIOC6A/MTIOC6A#/TMO4/TXD9/SMOSI9/SSDA9/RXD11/SMISO11/SSCL11/SSLA2/CRX0/USB0_ID/USB0_OVRCURA/IRQ14_DS/ADTRG0#    | CNA-4  | VRL_1(unused) |
| 59 | PA0/MTIOC6C/MTIOC6C#/TMO2/SCK9/TXD11/SMOSI11/SSDA11/SSLA3/CTX0/USB0_EXICEN/USB0_VBUSEN                               | CNA-14 | SW2#_1        |
| 60 | P35/A13/MTIOC2A/MTIOC9A/MTIOC2A#/MTIOC9A#/GTADSM0/TMO0/CTS8#/RTS8#/SS8#/TXD1/SMOSI1/SSDA1/IRQ6                       | CNA-13 | SW1#_1        |
| 61 | P34/A12/MTIOC2B/MTIOC9B/MTIOC2B#/MTIOC9B#/GTADSM1/GTETRGRB/TMO4/CTS9#/RTS9#/SS9#/RXD1/SMISO1/SSCL1/USB0_OVRCURB/IRQ3 | CNA-3  | LED3#_1       |
| 62 | PC6/MTIOC1A/MTIOC9C/MTIOC1A#/MTIOC9C#/RXD11/SMISO11/SSCL11/CRX0/IRQ11_DS                                             | CNA-2  | LED2#_1       |
| 63 | PC5/MTIOC1B/MTIOC9D/MTIOC1B#/MTIOC9D#/TXD11/SMISO11/SSDA11/CTX0/IRQ10_DS                                             | CNA-1  | LED1#_1       |
| 64 | VCC                                                                                                                  | VCC    | VCC           |
| 65 | P96/CS0#/WAIT#/GTETRGA/GTETRGRB/GTETRGC/GTETRGD/POE4#/CTS8#/RTS8#/SS8#/IRQ4_DS                                       | CN1-11 | N.C           |
| 66 | VSS                                                                                                                  | VSS    | VSS           |
| 67 | P95/MTIOC6B/MTIOC6B#/GTIOC4A/GTIOC7A/GTIOC4A#/GTIOC7A#                                                               | CNC-22 | UP_2          |
| 68 | P94/MTIOC7A/MTIOC7A#/GTIOC5A/GTIOC8A/GTIOC5A#/GTIOC8A#                                                               | CNC-21 | VP_2          |
| 69 | P93/MTIOC7B/MTIOC7B#/GTIOC6A/GTIOC9A/GTIOC6A#/GTIOC9A#                                                               | CNC-20 | WP_2          |
| 70 | P92/MTIOC6D/MTIOC6D#/GTIOC4B/GTIOC7B/GTIOC4B#/GTIOC7B#                                                               | CNC-19 | UN_2          |
| 71 | P91/MTIOC7C/MTIOC7C#/GTIOC5B/GTIOC8B/GTIOC5B#/GTIOC8B#                                                               | CNC-18 | VN_2          |
| 72 | P90/MTIOC7D/MTIOC7D#/GTIOC6B/GTIOC9B/GTIOC6B#/GTIOC9B#                                                               | CNC-17 | WN_2          |
| 73 | P76/D0/MTIOC4D/MTIOC4D#/GTIOC2B/GTIOC6B/GTIOC2B#/GTIOC6B#                                                            | CNA-7  | WN_1          |
| 74 | P75/D1/MTIOC4C/MTIOC4C#/GTIOC1B/GTIOC5B/GTIOC1B#/GTIOC5B#                                                            | CNA-8  | VN_1          |
| 75 | P74/D2/MTIOC3D/MTIOC3D#/GTIOC0B/GTIOC4B/GTIOC0B#/GTIOC4B#                                                            | CNA-9  | UN_1          |
| 76 | P73/D3/MTIOC4B/MTIOC4B#/GTIOC2A/GTIOC6A/GTIOC2A#/GTIOC6A#                                                            | CNA-10 | WP_1          |
| 77 | P72/D4/MTIOC4A/MTIOC4A#/GTIOC1A/GTIOC5A/GTIOC1A#/GTIOC5A#                                                            | CNA-11 | VP_1          |
| 78 | P71/D5/MTIOC3B/MTIOC3B#/GTIOC0A/GTIOC4A/GTIOC0A#/GTIOC4A#                                                            | CNA-12 | UP_1          |
| 79 | P70/D6/GTETRGA/GTETRGRB/GTETRGC/GTETRGRD/POE0#/CTS9#/RTS9#/SS9#/IRQ5_DS                                              | CNA-5  | FO#_1         |

Table 7-4 List of RX72T Pin Functions (4/5)

|     |                                                                                                                                       |        |          |
|-----|---------------------------------------------------------------------------------------------------------------------------------------|--------|----------|
| 80  | PG2/D11/GTETRGA/GTIOC0B/GTIOC0B#/SCK9/IRQ2/COMP0                                                                                      | CND-19 | UN_3     |
| 81  | PG1/D12/GTIOC0A/GTIOC0A#/TXD9/SMOSI9/SSDA9/IRQ1/COMP1                                                                                 | CND-22 | UP_3     |
| 82  | PG0/D13/GTIOC1B/GTIOC1B#/RXD9/SMISO9/SSCL9/IRQ0/COMP2                                                                                 | CND-18 | VN_3     |
| 83  | PK2/D14/GTIOC1A/GTIOC1A#/POE12#/CTS9#/RTS9#/SS9#/SCK5/IRQ9_DS/COMP3                                                                   | CND-21 | VP_3     |
| 84  | PK1/D15/GTIOC2B/GTIOC2B#/POE13#/CTS8#/RTS8#/SS8#/TXD5/SMOSI5/SSDA5/IRQ8_DS/COMP4                                                      | CND-17 | WN_3     |
| 85  | PK0/CS1#/GTIOC2A/GTIOC2A#/POE14#/RXD5/SMISO5/SSCL5/IRQ15_DS/COMP5                                                                     | CND-20 | WP_3     |
| 86  | P33/D7/MTIOC3A/MTCLKA/MTIOC3A#/MTCLKA#/GTIOC3B/GTIOC3B#/TMO0/SSLA3/IRQ13_DS                                                           | CN1-12 | N.C      |
| 87  | P32/D8/MTIOC3C/MTCLKB/MTIOC3C#/MTCLKB#/GTIOC3A/GTIOC3A#/TMO6/SSLA2/IRQ12_DS                                                           | CN1-15 | N.C      |
| 88  | VCC                                                                                                                                   | VCC    | VCC      |
| 89  | P31/D9/MTIOC0A/MTCLKC/MTIOC0A#/MTCLKC#/TMRI6/SSLA1/IRQ6                                                                               | CNC-27 | ENC_A_2  |
| 90  | VSS                                                                                                                                   | VSS    | VSS      |
| 91  | P30/D10/MTIOC0B/MTCLKD/MTIOC0B#/MTCLKD#/TMCI6/SCK8/CTS8#/RTS8#/SS8#/SSLA0/IRQ7/COMP3                                                  | CNC-28 | ENC_B_2  |
| 92  | P27/CS3#/MTIOC1A/MTIOC0C/MTIOC1A#/MTIOC0C#/POE9#/IRQ15                                                                                | CN1-16 | N.C      |
| 93  | P26/CS2#/MTIOC9A/MTIOC9A#/CTS1#/RTS1#/SS1#/IRQ11/ADST0                                                                                | CN1-17 | N.C      |
| 94  | P25/CS3#/MTIOC9C/MTIOC9C#/SCK1/IRQ10/ADST1                                                                                            | CN5-5  | HALL_W_1 |
| 95  | P24/D11/MTIC5U/MTIC5U#/TMCI2/TMO6/CTS8#/RTS8#/SS8#/SCK8/RSPCKA/IRQ4/COMP0                                                             | CN5-4  | HALL_V_1 |
| 96  | P23/D12/MTIC5V/MTIC5V#/TMO2/CACREF/TXD8/SMOSI8/SSDA8/TXD12/SMOSI12/SSDA12/TXDX12/SIOX12/MOSIA/CTX0/IRQ11/COMP1                        | CN5-3  | HALL_U_1 |
| 97  | P22/D13/MTIC5W/MTCLKD/MTIC5W#/MTCLKD#/MTIOC9B/TMRI2/TMO4/RXD8/SMISO8/SSCL8/RXD12/SMISO12/SSCL12/RXDX12/MISOA/CRX0/IRQ10/ADTRG2#/COMP2 | CN1-18 | N.C      |
| 98  | PC4/A20/MTIOC9B/MTIOC9B#/TXD1/SMOSI1/SSDA1/TXD12/SMOSI12/SSDA12/TXDX12/SIOX12/ADST2/COMP5                                             | CN1-19 | N.C      |
| 99  | PC3/MTIOC9D/MTIOC9D#/RXD1/SMISO1/SSCL1/RXD12/SMISO12/SSCL12/RXDX12/IRQ14/COMP4                                                        | CN1-20 | N.C      |
| 100 | P21/D14/MTIOC9A/MTCLKA/MTIOC9A#/MTCLKA#/TMCI4/TXD8/SMOSI8/SSDA8/TXD12/SMOSI12/SSDA12/TXDX12/SIOX12/MOSIA/IRQ6_DS/AN217/ADTRG1#/COMP5  | CN1-21 | N.C      |
| 101 | P20/D15/MTIOC9C/MTCLKB/MTIOC9C#/MTCLKB#/TMRI4/CTS8#/RTS8#/SS8#/SCK8/RSPCKA/IRQ7_DS/AN216/ADTRG0#/COMP4                                | CN1-22 | N.C      |
| 102 | P65/A12/IRQ9/AN211/CMPC53/DA1                                                                                                         | CN1-25 | N.C      |
| 103 | P64/A13/IRQ8/AN210/CMPC33/DA0                                                                                                         | CN1-26 | N.C      |
| 104 | AVCC2                                                                                                                                 | AVCC   | AVCC     |

Table 7-5 List of RX72T Pin Functions (5/5)

|     |                                                                                                     |        |               |
|-----|-----------------------------------------------------------------------------------------------------|--------|---------------|
| 105 | AVCC2                                                                                               | AVCC   | AVCC          |
| 106 | AVSS2                                                                                               | AVSS   | AVSS          |
| 107 | P63/A14/A12/IRQ7/AN209/CMPC23                                                                       | CNB-8  | VPN_1         |
| 108 | P62/A15/A13/IRQ6/AN208/CMPC43                                                                       | CNB-12 | VW_1          |
| 109 | P61/A16/A14/IRQ5/AN207/CMPC13                                                                       | CNB-11 | VV_1          |
| 110 | P60/A17/A15/IRQ4/AN206/CMPC03                                                                       | CNB-10 | VU_1          |
| 111 | P55/A18/A16/IRQ3/AN203/CMPC32                                                                       | CNC-2  | VPN_2         |
| 112 | P54/A19/A17/IRQ2/AN202/CMPC22                                                                       | CNC-9  | VW_2          |
| 113 | P53/A20/A18/IRQ1/AN201/CMPC12                                                                       | CNC-8  | VV_2          |
| 114 | P52/IRQ0/AN200/CMPC02                                                                               | CNC-7  | VU_2          |
| 115 | P51/AN205/CMPC52                                                                                    | CN1-27 | N.C           |
| 116 | P50/AN204/CMPC42                                                                                    | CND-5  | IW_3          |
| 117 | PH7/AN106/CVREFC1                                                                                   | CND-9  | VW_3          |
| 118 | PH6/AN105                                                                                           | CND-8  | VV_3          |
| 119 | PH5/AN104                                                                                           | CND-7  | VU_3          |
| 120 | P47/AN103                                                                                           | CND-4  | IV_3          |
| 121 | P46/AN102/CMPC50/CMPC51                                                                             | CNC-5  | IW_2          |
| 122 | P45/AN101/CMPC40/CMPC41                                                                             | CNC-4  | IV_2          |
| 123 | P44/AN100/CMPC30/CMPC31                                                                             | CNC-3  | IU_2          |
| 124 | PH4/AN107/PGAVSS1                                                                                   | CNC-1  | PGAVSS_2      |
| 125 | PH3/AN006/CVREFC0                                                                                   | CN1-28 | N.C           |
| 126 | PH2/AN005                                                                                           | CND-2  | VPN_3         |
| 127 | PH1/AN004                                                                                           | CND-3  | IU_3          |
| 128 | P43/AN003                                                                                           | CNB-15 | VR_1          |
| 129 | P42/AN002/CMPC20/CMPC21                                                                             | CNB-7  | IW_1          |
| 130 | P41/AN001/CMPC10/CMPC11                                                                             | CNB-6  | IV_1          |
| 131 | P40/AN000/CMPC00/CMPC01                                                                             | CNB-5  | IU_1          |
| 132 | PH0/AN007/PGAVSS0                                                                                   | CNB-4  | PGAVSS_1      |
| 133 | AVCC1                                                                                               | AVCC   | AVCC          |
| 134 | AVCC0                                                                                               | AVCC   | AVCC          |
| 135 | AVSS0                                                                                               | AVSS   | AVSS          |
| 136 | AVSS1                                                                                               | AVSS   | AVSS          |
| 137 | P82/ALE/WAIT#/MTIC5U/MTIC5U#/TMO4/SCK6/SCK12/IRQ3/COMP5                                             | CN1-29 | N.C           |
| 138 | P81/CS2#/MTIC5V/MTIC5V#/TMCI4/TXD6/SMOSI6/SSDA6/TXD12SMOSI12/SSDA12/TXDX12/SIOX12/COMP4             | CN1-30 | N.C           |
| 139 | P80/CS1#/MTIC5W/MTIC5W#/TMRI4/RXD6/SMISO6/SSCL6/RXD12/SMISO12/SSCL12/RXDX12/IRQ5/COMP3              | CN1-31 | N.C           |
| 140 | P11/RD#/MTIOC3A/MTCLKC/MTIOC3A#/MTCLKC#/MTIOC9D/GTIOC3B/GTETRGA/GTIOC3B#/GTETRGC/TMO3/POE9#/IRQ1_DS | CN1-32 | N.C           |
| 141 | P10/MTIOC9B/MTCLKD/MTIOC9B#/MTCLKD#/GTETRGB/GTETRGD/TMRI3/POE12#/CTS6#/RTS6#/SS6#/IRQ0_DS           | CNC-35 | VRL_2(unused) |
| 142 | P17/MTIOC4D/MTIOC4D#/GTIOC2B/GTIOC9B/GTIOC2B#/GTIOC9B#/IRQ14                                        | CNC-15 | LED3#_2       |
| 143 | P16/MTIOC4C/MTIOC4C#/GTIOC1B/GTIOC8B/GTIOC1B#/GTIOC8B#/IRQ13                                        | CNC-14 | LED2#_2       |
| 144 | P15/MTIOC3D/MTIOC3D#/GTIOC0B/GTIOC7B/GTIOC0B#/GTIOC7B#/IRQ12                                        | CNC-13 | LED1#_2       |

## 8. Caution Items

The product includes some unused pins that have not been processed. For information on accurate pin processing, refer to the hardware manual of the microcontroller.

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**Revision History**

| Rev. | Date          | Description |                      |
|------|---------------|-------------|----------------------|
|      |               | Page        | Summary              |
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