

# R8C/34K Group

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## USB Host Evaluation Board R0K5R8C34DK2HBR

### Hardware Instruction Manual

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#### Introduction

This application note is an instruction manual for the hardware used with evaluation board R0K5R8C34DK2HBR, which operates the USB Host function and microcontroller peripheral functions for R8C/34K Group MCUs.

#### Target Device

R8C/34K Group

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## 1. Preface

The R0K5R8C34DK2HBR is the evaluation board of the USB Host function and built-in functions in R8C/34K Group MCUs. This instruction manual explains how to setup up and operate the related hardware and offers cautionary notes concerning usage.

All components of the R0K5R8C34DK2HBR are listed under “6.1 Packing Components”. If you have any question about the R0K5R8C34DK2HBR, contact your local distributor.

## 2. Important

Before using this product, be sure to read this user's manual carefully.

Keep this user's manual, and refer to it when you have questions about this product.

### Product:

"Product" in this document collectively refers to the following products manufactured by Renesas Electronics Corporation

(1) R8C/34K Group USB Host Evaluation Board R0K5R8C34DK2HBR

"Product" herein encompasses neither the customer's user system nor the host machine.

### Purpose of use of the product:

This product is a device to support the development of systems that uses the R8C/34K Groups of Renesas MCUs. It provides support for system development in both software and hardware.

Be sure to use this product correctly according to said purpose of use. Please avoid using this product other than for its intended purpose of use.

### For those who use this product:

This product can only be used by those who have carefully read the user's manual and know how to use it.

Use of this product requires basic knowledge of electric circuits, logical circuits, and MCUs.

### When using this product:

- (1) This product is a development-support unit for use in your program development and evaluation stages. When a program you have finished developing is to be incorporated in a mass-produced product, the judgment as to whether it can be put to practical use is entirely your own responsibility, and should be based on evaluation of the device on which it is installed and other experiments.
- (2) In no event shall Renesas Electronics Corporation be liable for any consequence arising from the use of this product.
- (3) Renesas Electronics Corporation strives to provide workarounds for and correct trouble with products malfunctions, with some free and some incurring charges. However, this does not necessarily mean that Renesas Electronics Corporation guarantees the provision of a workaround or correction under any circumstances.
- (4) This product covered by this document has been developed on the assumption that it will be used for program development and evaluation in laboratories. Therefore, it does not fall within the scope of applicability of the Electrical Appliance and Material Safety Law and protection against electromagnetic interference when used in Japan.
- (5) Renesas Electronics Corporation cannot predict all possible situations and possible cases of misuse that carry a potential for danger. Therefore, the warnings in this user's manual and the warning labels attached to this product do not necessarily cover all such possible situations and cases. The customer is responsible for correctly and safely using this product.
- (6) The product covered by this document has not been through the process of checking conformance with UL or other safety standards and IEC or other industry standards. This fact must be taken into account when the product is taken from Japan to some other country.
- (7) This product is a product used for development of a program, and an evaluation stage. It cannot include in a user's product and cannot mass-produce.
- (8) Even if it is the case where fault is in the device carried in this product, it does not exchange for the fault repair article of a device.
- (9) Operation of all USB peripheral devices cannot be guaranteed.
- (10) The sample programs of this product are all references, and no one to guarantee the operation. Please use this sample program as a technological reference when customer's software is developed.

**Usage restrictions:**

This product has been developed as a means of supporting system development by users. Therefore, do not use it as an embedded device in other equipment. Also, do not use it to develop systems or equipment for use in the following fields.

- (1) Transportation and vehicular
- (2) Medical (equipment that has an involvement in human life)
- (3) Aerospace
- (4) Nuclear power control
- (5) Undersea repeaters

If you are considering the use of this product for one of the above purposes, please be sure to consult your local distributor.

**About product changes:**

We are constantly making efforts to improve the design and performance of our product. Therefore, the specification or design of the product, or this user's manual, may be changed without prior notice.

**About rights:**

- (1) We assume no responsibility for any damage or infringement on patent rights or any other rights arising from the use of any information, products or circuits presented in this user's manual.
- (2) The information or data in this user's manual does not implicitly or otherwise grant a license to patent rights or any other rights belonging to Renesas or to a third party.
- (3) This user's manual and this product are copyrighted, with all rights reserved by Renesas. This user's manual may not be copied, duplicated or reproduced, in whole or part, without prior written consent from Renesas.

**About diagrams:**

Some diagrams in this user's manual may differ from the objects they represent.

**Warranty:**

Renesas will exchange this board free of charge only due to manufacturing defects.

### 3. Precautions for Safety

#### 3.1 Definitions of Signal Words

This chapter describes the precautions which should be taken in order to use this product safely and properly. Be sure to read and understand this chapter before using this product.

Contact us if you have any questions about the precautions described here.

This chapter describes the precautions which should be taken in order to use this product safely and properly. Be sure to read this chapter before using this product.



**WARNING**

WARNING indicates a potentially dangerous situation that will cause death or heavy wound unless it is avoided.



**CAUTION**

CAUTION indicates a potentially dangerous situation that will cause a slight injury or a medium-degree injury or property damage unless it is avoided.

In addition to the two above, the following are also used as appropriate to indicate additional precautions.

[Notice] Point out the attention for the malfunction by wrong setting.

means WARNING or CAUTION.

Example:



**CAUTION AGAINST AN ELECTRIC SHOCK**

means PROHIBITION.

Example:



**DISASSEMBLY PROHIBITED**

means A FORCIBLE ACTION.

Example:



**UNPLUG THE POWER CABLE FROM THE RECEPTACLE.**

### 3.2 Warning

#### WARNING

##### Warnings for Power Supply:



If you connect the attached power cable with the stabilized power supply, be sure to connect it with the appropriate polarity (the red cable is connected to the power line. The black cable is connected to the ground).

Use this product within the appropriate voltage range. This product does NOT have a built in over voltage protection.

Do not touch the plug of the power cable when your hands are wet. This may cause electric shock.

If you need to use an AC adaptor, please confirm the connector shape, voltage and polarity. In addition, use an AC power cable which complies with the safety standard of the country.

Do NOT use the power supply function on the emulator, when both the emulator and another power supply are connected to this product at the same time.



When installing this equipment, insure that a reliable ground connection is maintained.



If you smell a strange odor, hear an unusual sound, or see smoke coming from this product, then disconnect power immediately. Do not use this as it is because of the danger of electric shock and/or fire. In this case, contact your local distributor.

Before setting up this product and connecting it to other devices, turn off power or remove a power cable to prevent injury or product damage.

##### Warnings to Be Taken for Handling:



Do not break down this product. Breaking down the product will void your warranty.

##### Warning for Installation:



Do not set this product in water or areas of high humidity. Make sure that the product does not get wet. Spilling water or some other liquid into the product may cause un-repairable damage.

##### Warning for Use temperature:



This equipment is to be used in an environment with a maximum ambient temperature of 35°C.

Care should be taken that this temperature is not exceeded.

### 3.3 Caution

#### CAUTION

**Cautions to Be Taken for Handling This Product:**

Use caution when handling the product. Be careful not to apply a mechanical shock.

Do not touch the connector pins of this product directly. Static electricity may damage the internal circuits.

When attaching and removing the cable, hold the plug of the cable and do not pull on the cable. Do not pull this product by the communications interface cable. Excessive flexing or force may break conductors.

When you connect an external board to this product through test pins, be careful not to short signal lines or between power line and ground. If this product is revised by the user, operation cannot be guaranteed.

**Note on Transporting the Product:**

When sending your product for repair, use the packing box and cushioning material supplied with the product when it was delivered to you and specify caution in handling (handling as precision equipment). If packing of your product is not complete, it may be damaged during transportation. When you pack your product in a bag, make sure to use the conductive plastic bag supplied with the product. If you use a different bag, it may lead to further trouble with your product due to static electricity.

**Caution to Be Taken for Disposal:**

Penalties may be applicable for incorrect disposal of this waste, in accordance with your national legislation.

**European Union regulatory notices:**

The WEEE (Waste Electrical and Electronic Equipment) regulations put responsibilities on producers for the collection and recycling or disposal of electrical and electronic waste. Return of WEEE under these regulations is applicable in the European Union only. This equipment (including all accessories) is not intended for household use. After use the equipment cannot be disposed of as household waste, and the WEEE must be treated, recycled and disposed of in an environmentally sound manner.

Renesas Electronics Europe GmbH can take back end of life equipment, register for this service at "<http://www.renesas.eu/weee>".

## 4. Function Overview

### 4.1 Supported Functions

The evaluation board supports the following functions using the R8C/34K Group MCU functions with on-board circuits.

- USB2.0 Function module (full-speed host function)
- On-chip debug function with connection to E8a emulator
- RS232C transmission function using UART 0ch
- LCD module with general I/O port control
- User 4 switches with A/D detection
- User 3 LEDs with general I/O port control
- Reprogramming of built-in Flash memory (user ROM area) with serial writer

The following MCU functions are extracted to the board surface as test pins.

- SSU/I<sup>2</sup>C transmission function pin
- A/D input pin x 2ch
- Pulse counter (timer) pin x 1ch
- External interrupt pin x 1ch
- PWM output pin x 2ch
- Test pins (TP) as the MCU I/O ports x 7ch

### 4.2 Related Data Sheets and Application Notes

Refer to the following data sheets and application notes when using this evaluation board. Download these documents from the following URL.

- R8C/34U Group, R8C/34K Group User's Manual : Hardware  
<http://www.renesas.com/products/mpumcu/r8c/Documentation.jsp>
- LCD Module (NHD - 0208BZ - RN - GBW) Data Sheet  
<http://www.newhavendisplay.com/>



## 5. Evaluation Board Configuration

### 5.1 Evaluation Board Top View

Figure 1 shows the top view of the evaluation board. The R83C/34K Group MCU is mounted in the center of the board, and the board performs specific USB transmission and MCU peripheral functions.

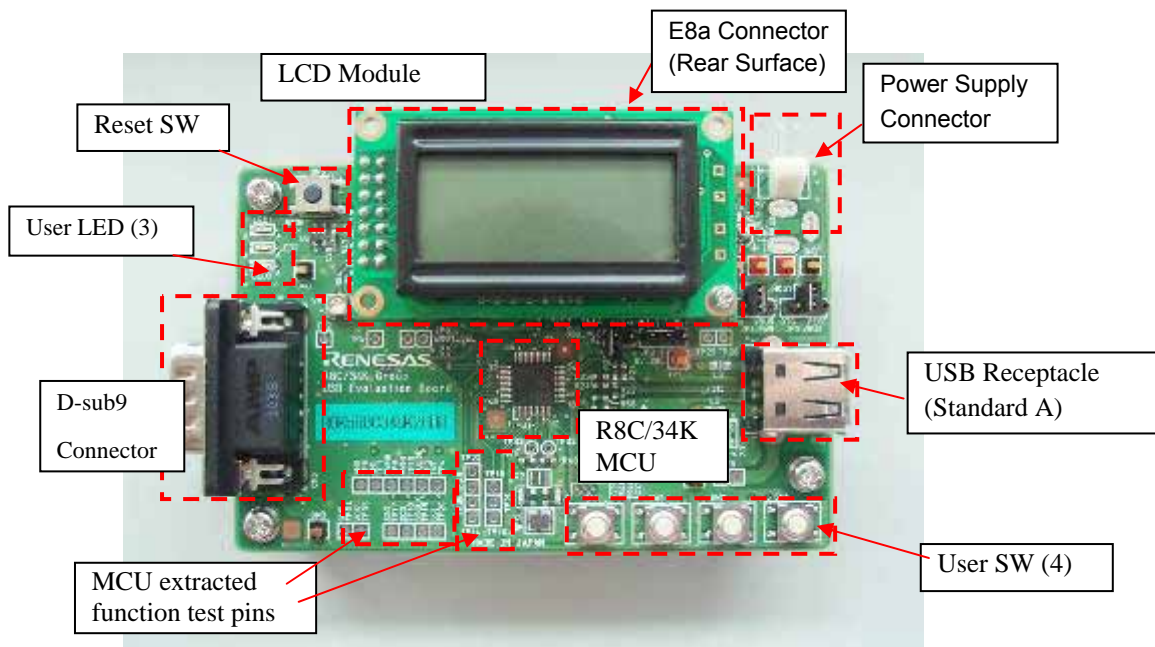


Figure 1 R0K5R8C34DK2HBR Board (Top View)



### 5.2 Evaluation Board Specifications

Table 1 lists the function specifications of the evaluation board and Table 2 provides the operating environment, power specifications and dimensions.

Table 1 R0K5R8C34DK2HBR Function Specifications

Item	Specifications	
MCU	R5F2134CKNFP (R8C/34K Group) Program ROM : 128KB Data Flash : 4KB RAM : 10KB	
External Clock	Crystal oscillator: DSX321G (Daishinku) 12MHz	
USB	MCU built-in, USB2.0-compliant, full-speed host functions	
RS232C	Connector	D-sub9 pin (male)
	Transceiver	MAX3226E (MAXIM)
LCD Module	NHD-0208BZ-RN-GBW (NEWHAVEN DISPLAY) Character-type LCD: features 8 characters x 2 lines	
Debug Function	1) On-chip debug function through E8a emulator connection 2) Reprogramming of built-in Flash memory (user ROM area) with serial writer	
User Switch	4 switches with A/D voltage detection	
User LED	3 LEDs (direct control through general IO ports)	
Reset Switch	Coupled with MCU Reset pin	
MCU extracted function test pin	SSU/I <sup>2</sup> C , PWM output pins x 2ch, pulse counter(TRAIO) pin, Interrupt pin, A/D pins x 2ch, Test pins as the MCU I/O ports x 7ch	

Table 2 R0K5R8C34DK2HBR Voltage, Dimensions, Environment Specifications

Parameter	Specifications
Operating Environment Conditions	Temperature: 5~35°C Humidity: no condensation Surrounding gas: no corrosive gas
Operating Voltage and Supply Source	Supply Voltage: 5.0V(4.7V to 5.5V) / 3.3V(3.0V to 3.6V) Note: When operating the USB Host function at 3.0V to 3.6V or E8a supply source, a separate 5V (4.7V to 5.5V) power supply is required for some of the circuits. Supply source: stabilized power supply E8a supply source [reference] typical current consumption approximately 50mA (excluding the current of USB VBUS for a USB peripheral device)   This product does NOT have a built in over voltage protection. Use this product within the appropriate voltage range.   The current consumption of this product varies depending on the usage. Ensure proper capacity of power source.
External Dimensions	100mm x 65mm (not including protruding areas or cord)

## 6. Evaluation Board Setup

### 6.1 Packing Components

Confirm all components included with the evaluation board before assembling. Figure2 shows a photo of all Assembly components; Table 3 lists the name and quantity of each component. Use four screws to add spacers to each corner of the board, allowing space for parts mounted on the backside of the board. Use the remaining screws to secure the LCD module with the anchoring spacer.

**Table 3 Assembly Components and Quantity**

Component Name	QTY
Evaluation board (R0K5R8C34DK2HBR)	1
[Assembly parts]	
Jumper Socket	4
Board anchoring spacers	4
Board anchoring spacer screws	4
LCD module	1
LCD anchoring spacer	1
LCD anchoring spacer screws	2
Power supply cable (incl. 2P connector)	1
Release Note (English / Japanese)	1 / 1
Table of Toxic and Hazardous Substance and Elements	1



**Figure 2 Assembly Components included with Evaluation Board**

### 6.2 Jumper Pin Switches for Power Supply during Operations

Jumper pins (JP1 to JP4) located on the evaluation board are used to switch power supply. Table 4 shows the setting for each jumper pin according to the power supply and voltage. The following is a detailed explanation of each jumper pin.

**Table 4 Jumper Pin Switches for Power Supply Source and Voltage**

Operation Type	Power Supply Source		JP1 (Main power switch)			JP2 (5V-dedicated switch)		JP3 (VBUS switch)			JP4 (USB power supply)	
	DC	E8a	DC	E8a	VBUS	Int	Ext	Peri	Host	OTG	OFF	ON
USB Host Operation	√ (5V)		√	-	-	√	-	-	√	-	√	-
	√ (3.3V)		√	-	-	-	√	-	√	-	-	√
		√ (5V)	-	√	-	-	√	-	√	-	√	-
		√ (3.3V)	-	√	-	-	√	-	√	-	-	√

JP1 (Figure 3) selects the main power supply source for components that can run on either 3.3V or 5V, such as the MCU, user LED, user switch, and RS232C transceiver. The supply source can be selected from the following: (1) stabilized power supply (DC), (2) E8a supply source (E8a).

[Notice] Don't select "VBUS" on JP1.

When using the stabilized power supply, supply power through CN7 (Figure 4). The red line of the attached power cable is connected to the power line (+) and the black line is connected to the ground (-) of the stabilized power supply.

If you need to use an AC adaptor, remove the CN7 connector and mount the connector to CN8 shown in No 14 of the Appendix 3 "Parts List". Select the AC adaptor with "center plus".



Mounting AC adapter connector is at your own risk.  
Be careful to check the polarity of the power supply and the supply voltage.

JP2 (Figure 5) selects the power supply source for components that can only run on 5V, such as the LCD module, the buffer IC for LCD and Host VBUS control IC. Supply sources can be selected from (1) internal input (direct from main power supply) and (2) external input. When the main power supply voltage is 3.3V or the power supply source is from E8a, supply additional power (5V) from external input TP1.

[Notice] When supplying external 5V to TP1 terminal, you must supply the power to TP1 prior to the main power supply to CN7.

JP3 (Figure 6) switches the VBUS power of the VBUS pin in the USB receptacle. Leave it fixed to "Host" position.

JP4 (Figure 7) switches the power supply to the MCU built-in USB module. Set it according to the main power supply voltage range. In addition, the VDDUSBE bit of the USBMC resistor in the MCU must be selected shown as Table 5.

**Table 5 The combination of the JP4 and the VDDUSBE bit by the main power supply voltage range**

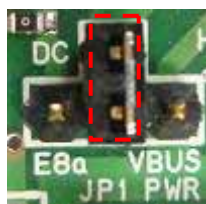
Voltage Range	JP4 setting	VDDUSBE bit
4.7V- 5.5V	"Open" ( Figure 7 Power supply "OFF")	"1" (Enables internal regulator for USB)
3.0V - 3.6V	"Short" (Figure 7 Power supply "ON")	"0" (Connects main power supply to USB)



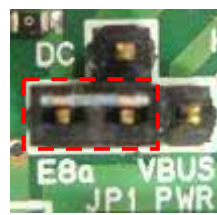
Do NOT leave JP4 to "short", when the voltage range of main power supply is from 4.7V to 5.5V.



Figure 3 JP1 Main power supply switch



“DC” setting



“E8a” setting

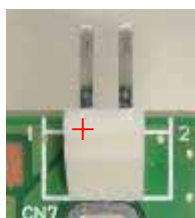
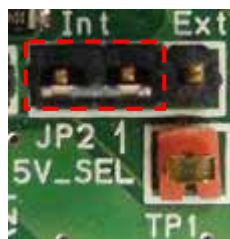


Figure 4 Stabilized power supply connector (CN7)

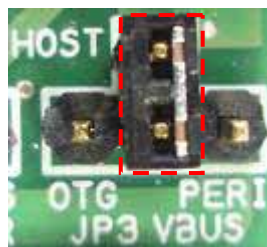


←External input pin (TP1)

Figure 5 JP2 5V-dedicated power supply switch “Internal input (int)” setting “External input (Ext)” setting



Figure 6 JP3 VBUS switch



“Host” setting



Figure 7 JP4 USB\_VCC switch



Power supply “ON” (Short) setting



Power supply “OFF” (Open) setting

### 6.3 Connecting the E8a Emulator

The on-chip debugger function of the R8C/34K Group MCU can be used by connecting the board to the E8a emulator manufactured by Renesas Electronics Corp. As shown in Figure 8, a 14-pin connector (CN6) is located on the back of the board for connecting the E8a emulator. When using E8a, leave JP6 in the open status (the default status at shipping) as shown in Figure 11. For more details on how to use the emulator, refer to the E8a application note.



Figure 8 Connector for E8a Emulator (CN6)



When you select “stabilized power supply (DC)” as the main power supply (JP1) for the evaluation board, “**Remove**” the check from the box next to “Supply power from emulator” as shown in Figure 9.

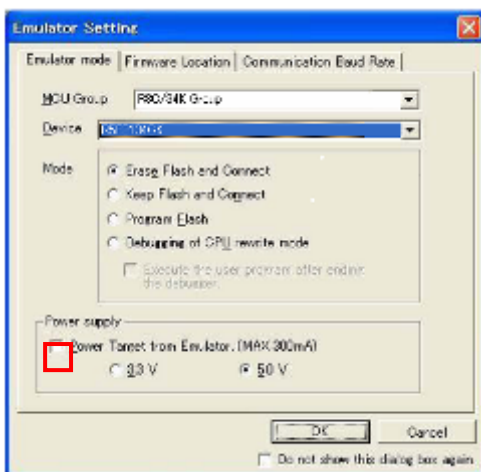


Figure 9 E8a Power Supply Check Box

## 6.4 Connecting the Serial Writer

The built-in Flash memory (user ROM area) in R8C/34K Group MCUs can be re-programmed with a computer or MCU (serial writer) that has a clock-asynchronous serial transmission (UART 0ch).

The board is equipped with an RS-232C transceiver IC, which is connected to the MCU UART0. UART transmission between the MCU and the serial writer is carried out through the D-sub9 pin male connector (CN5) as shown in Figure 10. When connecting a serial writer, short jumper JP6, as shown in Figure 11 by the wire. Refer to the application note for details concerning transmission protocol.



Figure 10 D-sub9 Pin Male Connector (CN5)



Figure 11 Switch Jumper (JP6) Serial Writer Function

## 7. Function Descriptions

Figure 12 is a general outline of the functions on the evaluation board. The board is equipped with an R8C/34K Group MCU and provides these functions using the MCU peripheral functions with the on-board circuits listed in Table 1. Each function is described in detail below. For details concerning the MCU functions, memory map, etc., refer to the R8C/34U Group, R8C/34K Group User's Manual: Hardware.

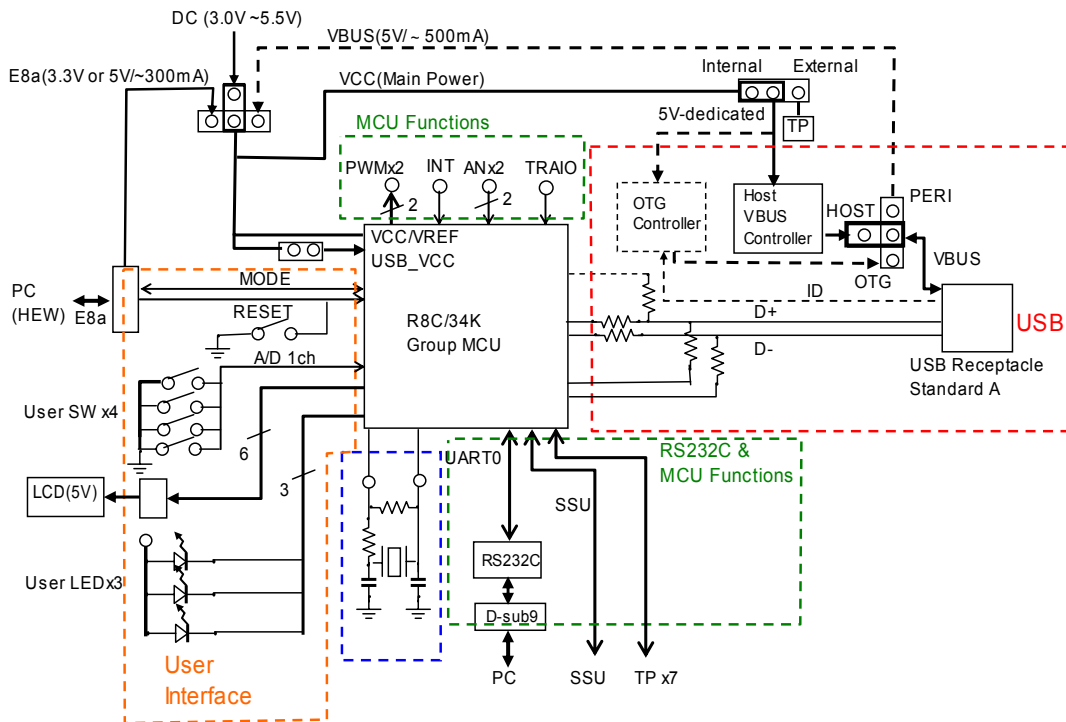


Figure 12 Evaluation Board General Function Outline

### 7.1 USB Function (Red dot line area of Figure 12)

The evaluation board is equipped with a USB Standard A receptacle and a host power supply (VBUS) control IC to enable use of the MCU USB Host function.



JP3 must be fixed to "HOST" position.

### 7.2 RS232C Transmission (Green dot line area of Figure 12)

The evaluation board is equipped with the RS232C transmission function, which uses the MCU UART0, and a D-sub9 pin male connector (CN5). Use a "cross through cable" when connecting the emulator to your computer.



### 7.3 User Switches with A/D Detection (Orange dot line area of Figure 12)

The evaluation board is equipped with four user switches. The MCU A/D function detects voltage when each switch is pushed. The circuit cannot detect voltage for multiple switches when pushed simultaneously. If more than one switch is pushed, the A/D function will detect voltage according to the following priority: SW4 > SW3 > SW2 > SW1. Table 6 provides the detecting voltage (ideal value) for each switch.

Table 6 A/D detecting voltage

Switch pushed	Detecting Voltage(Ideal value)
No switch pushed	5V
SW1	4.1V
SW2	3.2V
SW3	2.3V
SW4	0V

### 7.4 User LED (Orange dot line area of Figure 12)

The evaluation board is equipped with three LEDs that can be directly controlled from MCU I/O ports. To turn the LEDs on (light up), set the control I/O ports listed in Table 7 to “low”. The circuit is configured so that 7mA to 8mA current flows when an LED lights up, so make sure the drive capacity registers of the corresponding I/O port is set to “High”.

[Notice] The drive capacity for LED2 and LED3 I/O ports is set in 4-bit units, which means the drive capacity for other ports in the same grouping as these I/O ports will also go to “High”.

Table 7 LED Control I/O Ports

LED No. (color)	Corresponding I/O port name
LED1 (red)	P16
LED2 (yellow)	P81
LED3 (green)	P30

## 7.5 LCD Module Control (Orange dot line area of Figure 12)

The evaluation board includes an LCD module that is controlled through MCU I/O ports. The LCD module displays 2 lines of 8 characters each; this is a character type module with the character font stored in the module. The LCD module is controlled with 6 pins: a 4-bit data bus and 2 control signals. Table 8 shows the ports assigned for LCD module control. Refer to the LCD module data sheet for details concerning access timing, character data, etc.

The evaluation board also employs a semi-fixed resistor (VR1) for adjusting contrast on the LCD module (shown as Figure 13). Use this to adjust contrast as needed.

**Table 8 LCD Module Control Pin and Corresponding I/O Port Name**

LCD Module Pin	Corresponding I/O Port Name
D7	P03
D6	P02
D5	P01
D4	P00
RS	P13
E	P12



**Figure 13 semi-fixed resistor (VR1)**

## 7.6 Reset Switch (Orange dot line area of Figure 12)

The evaluation board is equipped with the reset switch. The signal of the evaluation board reset switch is coupled with the reset signal from E8a and connected to the MCU reset pin.

## 7.7 Oscillator Circuit (Blue dot line area of Figure 12)

The evaluation board is equipped with a crystal oscillation circuit required for the MCU built-in USB function. Make sure the board is set to use the crystal oscillation circuit before using the USB function. For details concerning usage, refer to the R8C/34U Group, R8C/34K Group User's Manual: Hardware.

## 7.8 Test Pins on the board

In order to connect external devices and enable MCU functions, test pins from MCU ports are grouped on the lower left area of the evaluation board, as shown in Figure 14 and Figure 15. Test Pin (TP) No. and corresponding port functions are listed in Table 9.

A protection circuit is mounted on the board for the A/D input pins (AN0, AN1) and a pull-up resistor is mounted on the board for INT (TP4), PULSE (TP3), SSO(TP17), SCS(TP18), SSCLK(TP19) and SSI(TP20) pins. For details on how to use each MCU peripheral function, refer to the R8C/34U Group, R8C/34K Group User's Manual: Hardware.



When you connect the external device to this product through test pins, be careful not to short signal lines or between power line and ground. If this product is revised by the user, operation cannot be guaranteed.

**Table 9 Relation between Test Pin No. and the MCU I/O Port No**

TP No. (Pin Name)	Function Name (assumption)	Corresponding I/O Port Number
TP17(SSO)	SSO(SSU)/SDA(I <sup>2</sup> C)	P37
TP18(SCS)	SCS(SSU)	P33
TP19(SSCLK)	SSCK (SSU)/SCL(I <sup>2</sup> C)	P35
TP20(SSSI)	SSI (SSU)	P34
TP6(AN0)	AN8 (A/D)	P10
TP7(AN1)	AN9 (A/D)	P11
TP8(PWM0)	TRCIOB (timer)	P05
TP10(PWM1)	TRCIOD (timer)	P06
TP3(PULSE)	TRAIO (timer)	P17
TP4(INT)	INT0 (Interrupt)	P45
TP14 (-)	-	P80
TP15 (-)	-	P60
TP16 (-)	-	P44
TP21 (-)	-	P43
TP22 (-)	-	P04
TP36 (-)	-	P82

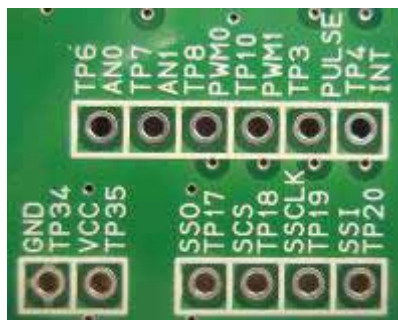


Figure 14 Test pins from MCU port on the board (1)

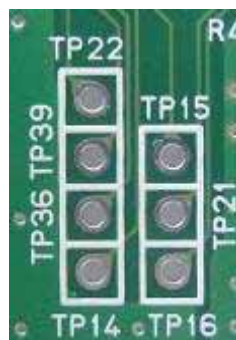


Figure 15 Test pins from MCU port on the board (2)

## 8. MCU Pin Setting Examples

Table 10 shows examples of settings for each MCU pin. Refer to instructions in the corresponding MCU user's manual: hardware on how to treat unused pins for functions not used on the evaluation board.

[Notice] The MCU pull-up resistor is set in 4-bit units for most of the pins. When using the MCU internal pull-up resistor to process unused pins, be sure that the resistor setting does not affect the function of other pins set at the same time.

Table 10 Example Settings for Used and Unused MCU Pin Functions

Pin No.	Pin Function	Function	Example setting when not using function
1	P60	P60 (TP15)	P60 Input (built-in pull-up resistor valid) *1
2	P30/TRAO	P30 (LED3)	P30 Output (Fix High )
3	VREF	VREF	- (Fix VCC_MAIN)
4	MODE	MODE	- (Use E8a emulator)
5	P43	P43 (TP21)	P43 Input (built-in pull-up resistor invalid) *1
6	P44	P44 (TP16)	P44 Output (Fix High ) *1
7	RESET_n	RESET_n	- (Use E8a emulator and Reset Switch)
8	P47/XOUT	XOUT	- ( Oscillator exclusive use) *1 *2
9	VSS/AVSS	VSS/AVSS	-
10	P46/XIN	XIN	- ( Oscillator exclusive use) *1 *2
11	VCC/AVCC	VCC/AVCC	-
12	P37/SSO/SDA/TRAO	SSO/SDA	P37 Input (built-in pull-up resistor invalid)
13	P35/SSCK/SCL/TRCIOD	SSCK/SCL	P35 Input (built-in pull-up resistor invalid)
14	P34/IVREF3/SSI/TRCIOC	SSI	P34 Input (built-in pull-up resistor invalid)
15	P33/IVCMP3/SCS/CTS2/RTS2/TRCCLK	SCS	P33 Input (built-in pull-up resistor invalid)
16	P77/USB_VBUSEN	USB_VBUSEN	P77 Input (built-in pull-up resistor invalid) *3
17	P76/USB_OVRCURA	USB_OVRCURA	P76 Input (built-in pull-up resistor invalid) *4 (P77)
18	USB_VBUS	USB_VBUS	- (USB exclusive use)
19	USB_DM	USB_DM	- (USB exclusive use)
20	USB_DP	USB_DP	- (USB exclusive use)
21	USB_VCC	USB_VCC	JP4 "Open" * refer to 6.2
22	USB_DPUPE	USB_DPUPE	- (USB exclusive use)
23	USB_DPRPD	USB_DPRPD	- (USB exclusive use)
24	USB_DRPD	USB_DRPD	- (USB exclusive use)
25	P67/INT3/TRCIOD/USB_ID	USB_ID	P67 Output (Fix High) *1 *4 (P65)
26	P66/INT2/TXD2/SDA2/USB_OVRCURB	USB_OVRCURB	P66 Input (built-in pull-up resistor invalid) *4 (P65)
27	P65/INT4/CLK2/CLK1/USB_EXICEN	USB_EXICEN	P65 Input (built-in pull-up resistor invalid) *3
28	P45/ADTRG/INT0/RXD2/SCL2	INT0	P45 Input (built-in pull-up resistor invalid)
29	P17/IVCMP1/INT1/TRAIO	TRAIO	P17 Input (built-in pull-up resistor invalid)
30	P16/IVREF1/CLK0	P16 (LED1)	P16 Output (Fix High)
31	P15/INT1/RXD0/TRAIO	RXD0(RS-232C)	P15 Input (built-in pull-up resistor invalid) *2(U4.9pin)
32	P14/TXD0/TRCCLK	TXD0(RS-232C)	P14 Output (Fix High) *1
33	P13/AN11/KI3/TRCIOC/TRBO	LCD_RS (LCD)	P13 Output (Fix High) *1
34	P12/AN10/KI2/TRCIOB	LCD_E (LCD)	P12 Output (Fix High) *1
35	P11/AN9/KI1/TRCIOA/TRCTR	AN9 (AN1)	P11 Input (built-in pull-up resistor valid) *1
36	P10/AN8/KI0/TRCIOD	AN8 (AN0)	P10 Input (built-in pull-up resistor valid) *1
37	P07/AN0/TRCIOC	AN0 (User switch)	P07 Input (built-in pull-up resistor invalid)
38	P06/AN1/TRCIOD	TRCIOD (PWM1)	P06 Output (Fix High) *4 )P07(AN0))
39	P05/AN2/TRCIOB	TRCIOB (PWM0)	P05 Output (Fix High) *4 )P07(AN0))
40	P04/AN3/TRCIOB	P04 (TP22)	P04 Output (Fix High) *4 )P07(AN0))
41	P03/AN4/CLK1/TRCIOB	LCD_D7 (LCD)	P03 Output (Fix High) *1
42	P02/AN5/RXD1/TRCIOA/TRCTR	LCD_D6 (LCD)	P02 Output (Fix High) *1
43	P01/AN6/TXD1/TRCIOA/TRCTR	LCD_D5 (LCD)	P01 Output (Fix High) *1
44	P00/AN7/TRCIOA/TRCTR	LCD_D4 (LCD)	P00 Output (Fix High) *1
45	P83/RXD3/TRFI/TRFO10	P83 (TP39)	P83 Output (Fix High) *1
46	P82/TXD3/TRFO02	P82 (TP36)	P82 Output (Fix High) *1
47	P81/CLK3/TRFO01	P81 (LED2)	P81 Output (Fix High)
48	P80/TRFO00	P80 (TP14)	P80 Output (Fix High) *1

- . \*1 : When select “Input direction” with invalid of internal pull-up resistor, the input pin is in the high-impedance state.
- \*2 : When select “Output direction”, output signal might conflict.
- \*3 : When select “Input direction” with valid of internal pull-pull resistor, the signal voltage is midpoint potential by the external pull-down resistor.
- \*4 : When select “Input direction” with valid of internal pull-up resistor, be sure that the resistor setting does not affect the function of other pins set at the same time.

## 9. Circuit Diagram

See attached document. (Appendix 1)

## 10. Parts Layout Diagram

See attached document. (Appendix 2)

## 11. Parts List

See attached document. (Appendix 3)

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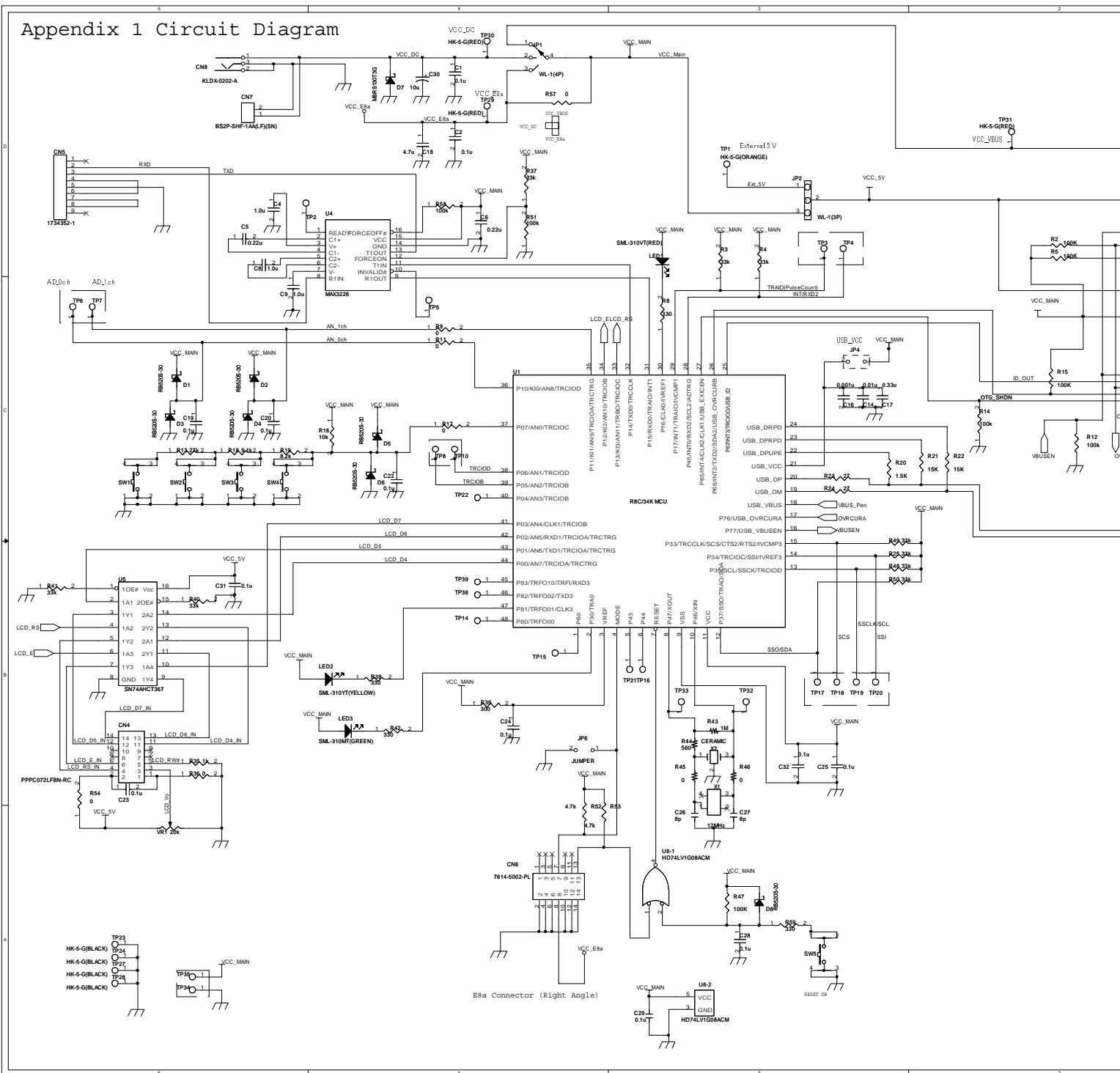
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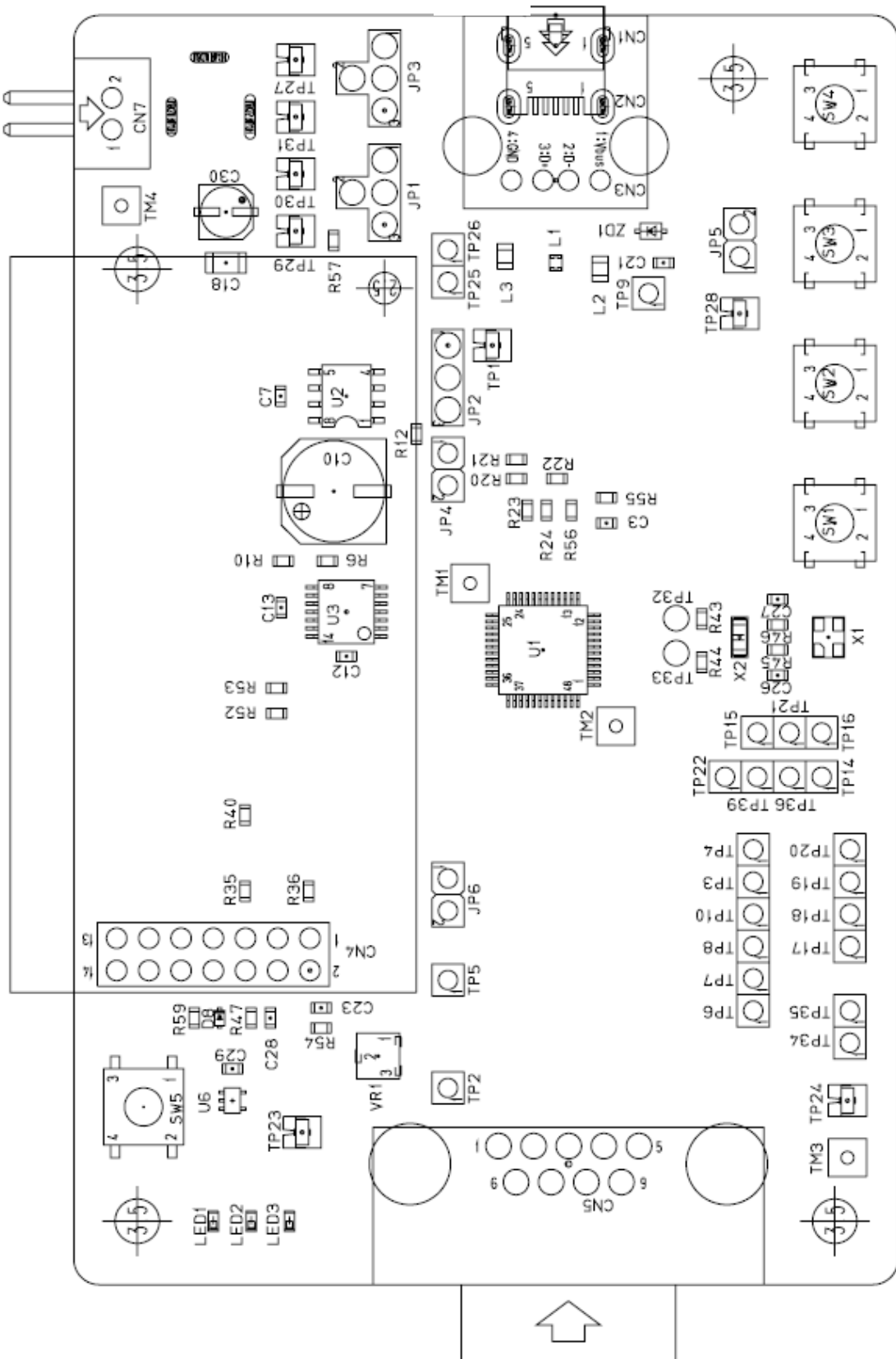
# Appendix 1 Circuit Diagram



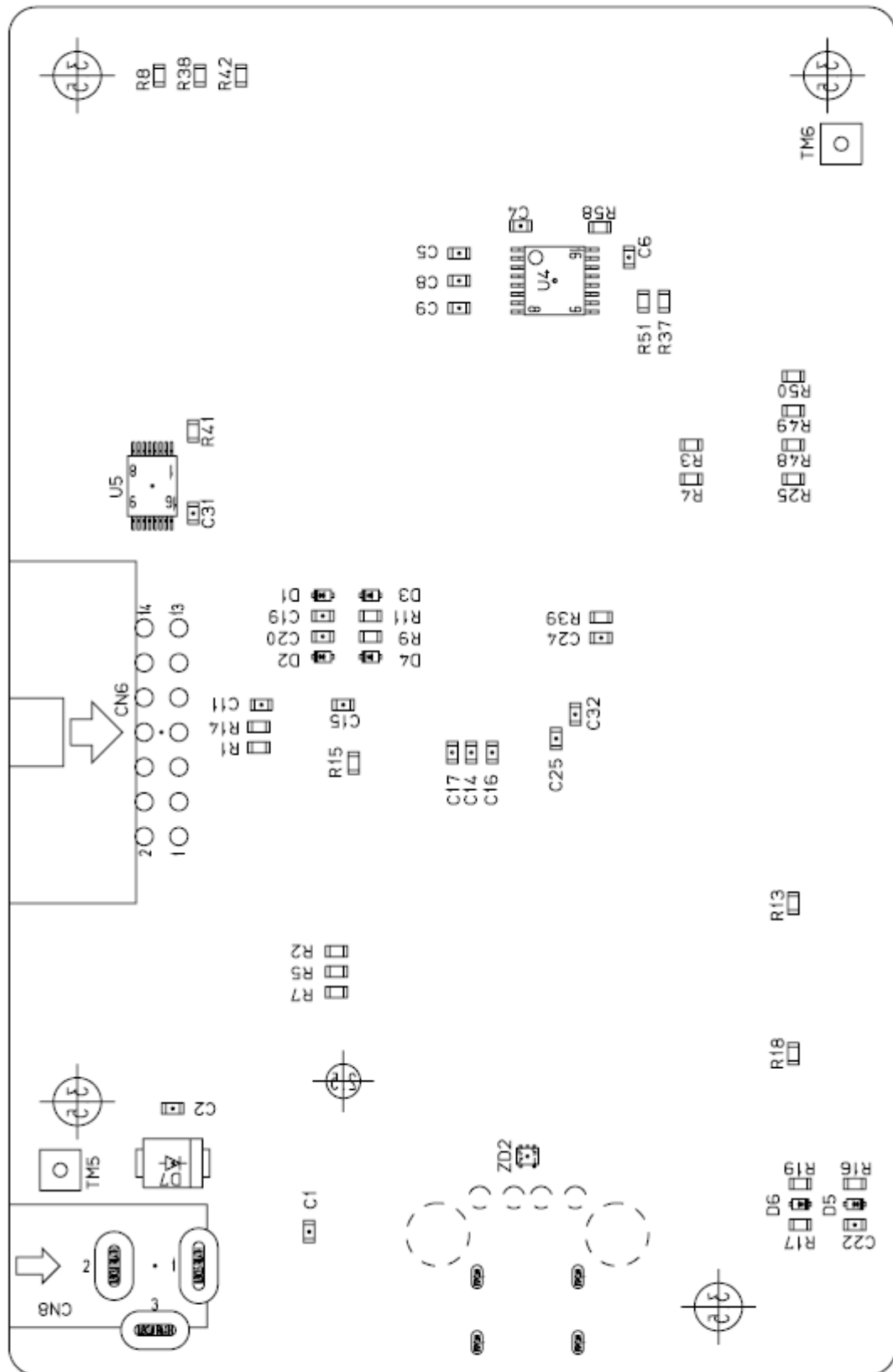


# Appendix2: Parts Layout Diagram

## 1. Front Surface



## 2. Rear Surface



## Appendix3: Parts List

		PPL-R0K5R8C34DK2HBR		Title	R0K5R8C34
No.	Component Name		Component Specification		
	Type	Symbol on Board	Product Number (specification)	Manufacture	M un
1	CPU	U1	R8F2134CKNFP	Renesas Electronics	
2	USB Power Switch IC	U2	MIC2506YM	MICREL	
3	OTG Control IC	U3	MAX3355EEUD+	MAXIM	un
4	RS232C Transceiver	U4	MAX3226ECUE+	MAXIM	
5	Buffer IC	U5	SN74AHCT367DGVR	TI	
6	Uni-logic IC	U6	HD74LV1G08ACME-E	Renesas Electronics	
7	USB Micro AB Socket	CN1	ZX62-AB-5PA(11)	HIROSE	un
8	USB Mini B Socket	CN2	CAM-E48F-005-8902A	MITSUMI	un
9	USB A Socket	CN3	UBA-4R-D14-1(LF)(SN)	JST	
10	Socket (14pin) for LCD	CN4	PPPC-072LFBN_RC	Sullins	
11	D-sub connector (9pin)	CN5	1734352-1	TE	
12	Socket (14pin) for E8a	CN6	7614-5002-PL	3M	
13	Header (2pin)	CN7	BS2P-SHF-1AA(LF)(SN)	JST	
14	DC Power Jack	CN8	KLDX-0202-A	Keycon	un
15	Crystal Oscillator	X1	DSX321G 12MHz	Daishinku	
16	Ceramic Resonators	X2	CSTCE12M0GH5	Murata Manufacturing	un
17	LED	LED1	SML-310VT	ROHM	
18	LED	LED2	SML-310YT	ROHM	
19	LED	LED3	SML-310MT	ROHM	
20	Schottky barrier diode	D1-6,D8	RB520S-30	ROHM	
21	Schottky barrier diode	D7	MBRS130LT3G	Onsemi	
22	Zener Diode	ZD2	RKZ6.8Z4KT	Renesas Electronics	un
23	Zener Diode	ZD1	HZU6.8Z	Renesas Electronics	un

No.	Component Name		Component Specifications	
	Type	Symbol on Board	Product Number (specification)	Manufacturer
24	Chip Common Mode Choke Coils	L1	DLP11SN900HL2	Murata Manufac
25	Chip Ferrite Beads	L2,L3	BLM21PG600SN1	Murata Manufac
26	Thick Film Resistors	R52,R53	MCR03EZPJ472	ROHM
27	Thick Film Resistors	R3,R4,R25,R37,R40,R41,R48,R49,R50	MCR03EZPJ333	ROHM
28	Thick Film Resistors	R2,R5,R10,R12,R14,R15,R47,R51,R55,R58	MCR03EZPJ104	ROHM
29	Thick Film Resistors	R39	MCR03EZPJ301	ROHM
30	Thick Film Resistors	R8,R38,R42,R59	MCR03EZPJ331	ROHM
31	Thick Film Resistors	R1,R7,R16	MCR03EZPJ103	ROHM
32	Thick Film Resistors	R56	MCR03EZPJ101	ROHM
33	Thick Film Resistors	R9,R11,R17,R36,R45,R46,R54,R57	MCR03EZPJ000	ROHM
34	Thick Film Resistors	R13	MCR03EZPJ273	ROHM
35	Thick Film Resistors	R18	MCR03EZPJ912	ROHM
36	Thick Film Resistors	R19	MCR03EZPJ822	ROHM
37	Thick Film Resistors	R20	MCR03EZPJ152	ROHM
38	Thick Film Resistors	R21,R22	MCR03EZPJ153	ROHM
39	Thick Film Resistors	R23,R24	MCR03EZPJ270	ROHM
40	Thick Film Resistors	R6,R43	MCR03EZPJ105	ROHM
41	Thick Film Resistors	R44	MCR03EZPFX5600	ROHM
42	Thick Film Resistors	R35	MCR03EZPJ102	ROHM
43	Trimmer Potentiometers	VR1	PVG3G203C01	Murata Manufac
44	Chip Monolithic Ceramic Capacitor	C14	GRM188B11H103KA01D	Murata Manufac
45	Chip Monolithic Ceramic Capacitor	C1,C2,C7,C11,C13,C19,C20,C22,C23,C24,C25,C28,C29,C31,C32	GRM188B11E104KA01D	Murata Manufac
46	Chip Monolithic Ceramic Capacitor	C3,C4,C8,C9,C12,C15,C21	GRM188R61E105KA01D	Murata Manufac
47	Chip Monolithic Ceramic Capacitor	C26,C27	GRM1885C1H8R0DZ01D	Murata Manufac
48	Chip Monolithic Ceramic Capacitor	C5,C6	GRM188R71C224KA01D	Murata Manufac

No.	Component Name		Component Specification		
	Type	Symbol on Board	Product Number (specification)	Manufacture	M un
49	Chip Monolithic Ceramic Capacitor	C16	GRM188B11H102KA01D	Murata Manufacturing	
50	Chip Monolithic Ceramic Capacitor	C17	GRM188R71C334KA01D	Murata Manufacturing	
51	Chip Monolithic Ceramic Capacitor	C18	GRM31CR61C475KA01L	Murata Manufacturing	unm
52	Aluminum Electrolytic Capacitor	C30	UWT1C100MCL1GB	Nichicon	
53	Aluminum Electrolytic Capacitor	C10	RHA1C151MCN1GS	Nichicon	
54	Push SW	SW5	B3FS-1000	OMRON	
55	Push SW	SW1,SW2,SW3,SW4	B3SN-3012	OMRON	
56	Jumper SW (2P)	JP4,JP5,JP6	WL-1	MAC8	
57	Jumper SW (3P)	JP2	WL-1	MAC8	
58	Jumper SW (4P)	JP1,JP3	WL-1	MAC8	
59	TP(SMD)	TP23,TP24,TP27,TP28	HK-5-G(black)	MAC8	
60	TP(SMD)	TP1	HK-5-G(orange)	MAC8	
61	TP(SMD)	TP29,TP30,TP31	HK-5-G(red)	MAC8	
62	PCB	-	R0K5R8C34DK2	SANYO KOGYO	
	Assembly parts				
63	LCD module		NHD-0208BZ-RN-GBW	NEWHAVENDISPLAY	
64	Male connector for LCD module		FFC-14BSM1B	HONDA	
65	Spacer		ASB-316E	HIROSUGI	
66	Screw		B-0306-S1	HIROSUGI	
67	Spacer for LCD module		ASB-2011E	HIROSUGI	
68	Screw for LCD module		B-0206-S1	HIROSUGI	
69	Jumper Socket	for JP1,JP2,JP3,JP4	XJ8A-0241	OMRON	
70	Housing for Power Cable		H2P-SHF-AA	JST	
71	Contact for Power Cable		SHF-001T-0.8BS	JST	
72	Black Cable for Power Cable		UL1007-AWG24-BLACK	SHINAGAWA ELECTRIC WIRE	
73	Red Cable foe Power Cable		UL1007-AWG24-RED	SHINAGAWA ELECTRIC WIRE	
*					



## General Precautions in the Handling of MPU/MCU Products

The following usage notes are applicable to all MPU/MCU products from Renesas. For detailed usage notes on the products covered by this manual, refer to the relevant sections of the manual. If the descriptions under General Precautions in the Handling of MPU/MCU Products and in the body of the manual differ from each other, the description in the body of the manual takes precedence.

### 1. Handling of Unused Pins

Handle unused pins in accord with the directions given under Handling of Unused Pins in the manual.

- The input pins of CMOS products are generally in the high-impedance state. In operation with an unused pin in the open-circuit state, extra electromagnetic noise is induced in the vicinity of LSI, an associated shoot-through current flows internally, and malfunctions occur due to the false recognition of the pin state as an input signal become possible. Unused pins should be handled as described under Handling of Unused Pins in the manual.

### 2. Processing at Power-on

The state of the product is undefined at the moment when power is supplied.

- The states of internal circuits in the LSI are indeterminate and the states of register settings and pins are undefined at the moment when power is supplied.

In a finished product where the reset signal is applied to the external reset pin, the states of pins are not guaranteed from the moment when power is supplied until the reset process is completed.

In a similar way, the states of pins in a product that is reset by an on-chip power-on reset function are not guaranteed from the moment when power is supplied until the power reaches the level at which resetting has been specified.

### 3. Prohibition of Access to Reserved Addresses

Access to reserved addresses is prohibited.

- The reserved addresses are provided for the possible future expansion of functions. Do not access these addresses; the correct operation of LSI is not guaranteed if they are accessed.

### 4. Clock Signals

After applying a reset, only release the reset line after the operating clock signal has become stable. When switching the clock signal during program execution, wait until the target clock signal has stabilized.

- When the clock signal is generated with an external resonator (or from an external oscillator) during a reset, ensure that the reset line is only released after full stabilization of the clock signal. Moreover, when switching to a clock signal produced with an external resonator (or by an external oscillator) while program execution is in progress, wait until the target clock signal is stable.

### 5. Differences between Products

Before changing from one product to another, i.e. to one with a different type number, confirm that the change will not lead to problems.

- The characteristics of MPU/MCU in the same group but having different type numbers may differ because of the differences in internal memory capacity and layout pattern. When changing to products of different type numbers, implement a system-evaluation test for each of the products.

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