

# RA4 Group

APP\_LCD-EK\_SEG\_1  
Application Board for RA4 Microcontroller Group  
Segment LCD Application Board v1  
User's Manual

Renesas RA4 Family  
RA4 Series

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# General Precautions in the Handling of Microprocessing Unit and Microcontroller Unit Products

The following usage notes are applicable to all Microprocessing unit and Microcontroller unit products from Renesas. For detailed usage notes on the products covered by this document, refer to the relevant sections of the document as well as any technical updates that have been issued for the products.

## 1. Precaution against Electrostatic Discharge (ESD)

A strong electrical field, when exposed to a CMOS device, can cause destruction of the gate oxide and ultimately degrade the device operation. Steps must be taken to stop the generation of static electricity as much as possible, and quickly dissipate it when it occurs. Environmental control must be adequate. When it is dry, a humidifier should be used. This is recommended to avoid using insulators that can easily build up static electricity. Semiconductor devices must be stored and transported in an anti-static container, static shielding bag or conductive material. All test and measurement tools including work benches and floors must be grounded. The operator must also be grounded using a wrist strap. Semiconductor devices must not be touched with bare hands. Similar precautions must be taken for printed circuit boards with mounted semiconductor devices.

## 2. Processing at power-on

The state of the product is undefined at the time 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 time 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 time 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 time when power is supplied until the power reaches the level at which resetting is specified.

## 3. Input of signal during power-off state

Do not input signals or an I/O pull-up power supply while the device is powered off. The current injection that results from input of such a signal or I/O pull-up power supply may cause malfunction and the abnormal current that passes in the device at this time may cause degradation of internal elements. Follow the guideline for input signal during power-off state as described in your product documentation.

## 4. Handling of unused pins

Handle unused pins in accordance 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 the 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.

## 5. Clock signals

After applying a reset, only release the reset line after the operating clock signal becomes stable. When switching the clock signal during program execution, wait until the target clock signal is 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. Additionally, 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.

## 6. Voltage application waveform at input pin

Waveform distortion due to input noise or a reflected wave may cause malfunction. If the input of the CMOS device stays in the area between  $V_{IL}$  (Max.) and  $V_{IH}$  (Min.) due to noise, for example, the device may malfunction. Take care to prevent chattering noise from entering the device when the input level is fixed, and also in the transition period when the input level passes through the area between  $V_{IL}$  (Max.) and  $V_{IH}$  (Min.).

## 7. Prohibition of access to reserved addresses

Access to reserved addresses is prohibited. The reserved addresses are provided for possible future expansion of functions. Do not access these addresses as the correct operation of the LSI is not guaranteed.

## 8. Differences between products

Before changing from one product to another, for example to a product with a different part number, confirm that the change will not lead to problems. The characteristics of a microprocessing unit or microcontroller unit products in the same group but having a different part number might differ in terms of internal memory capacity, layout pattern, and other factors, which can affect the ranges of electrical characteristics, such as characteristic values, operating margins, immunity to noise, and amount of radiated noise. When changing to a product with a different part number, implement a system-evaluation test for the given product.

## Renesas Segment LCD Application Board Disclaimer

By using this Segment LCD Application Board, the User accepts the following terms, which are in addition to, and control in the event of disagreement, with Renesas' General Terms and Conditions available at [renesas.com/legal-notice](https://www.renesas.com/legal-notice).

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Renesas does not consider the Segment LCD Application Board to be a finished product and therefore the Segment LCD Application Board may not comply with some requirements applicable to finished products, including, but not limited to recycling, restricted substances and electromagnetic compatibility regulations. Refer to Certifications section, for information about certifications and compliance information for the Segment LCD Application Board. It is the kit User's responsibility to make sure the kit meets any local requirements applicable to their region.

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## Precautions

This Application Board is only intended for use in a laboratory environment under ambient temperature and humidity conditions. A safe separation distance should be used between this and any sensitive equipment. Its use outside the laboratory, classroom, study area, or similar such area invalidates conformity with the protection requirements of the Electromagnetic Compatibility Directive and could lead to prosecution.

The product generates, uses, and can radiate radio frequency energy and may cause harmful interference to radio communications. There is no guarantee that interference will not occur in a particular installation. If this equipment causes harmful interference to radio or television reception, which can be determined by turning the equipment off or on, you are encouraged to try to correct the interference by one or more of the following measures:

- Ensure attached cables do not lie across the equipment.
- Reorient the receiving antenna.
- Increase the distance between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that which the receiver is connected.
- Power down the equipment when not in use.
- Consult the dealer or an experienced radio/TV technician for help.

Note: It is recommended that wherever possible shielded interface cables are used.

The product is potentially susceptible to certain EMC phenomena. To mitigate against them it is recommended that the following measures be undertaken:

- The user is advised that mobile phones should not be used within 10 m of the product when in use.
- The user is advised to take ESD precautions when handling the equipment.

The Application Board does not represent an ideal reference design for an end product and does not fulfill the regulatory standards for an end product.

## Renesas RA4 Family

# Segment LCD Application Board v1

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### 1. Kit Overview

The APP\_LCD Segment Application Board for RA4 MCU Group, enables users to add LCD functionality using a MCU segment LCD controller and seamlessly evaluate the features of the RA4 MCU group and develop embedded systems applications using Flexible Software Package (FSP) and e<sup>2</sup> studio IDE. The users can utilize rich on-board features along with their choice of popular ecosystems add-ons to bring their big ideas to life.

**Key Features:**

- Adds LCD functionality via segment interface.
- Compatible with EK-RA4L1 and EK-RA4C1, connects to J2 (segment display interface header).

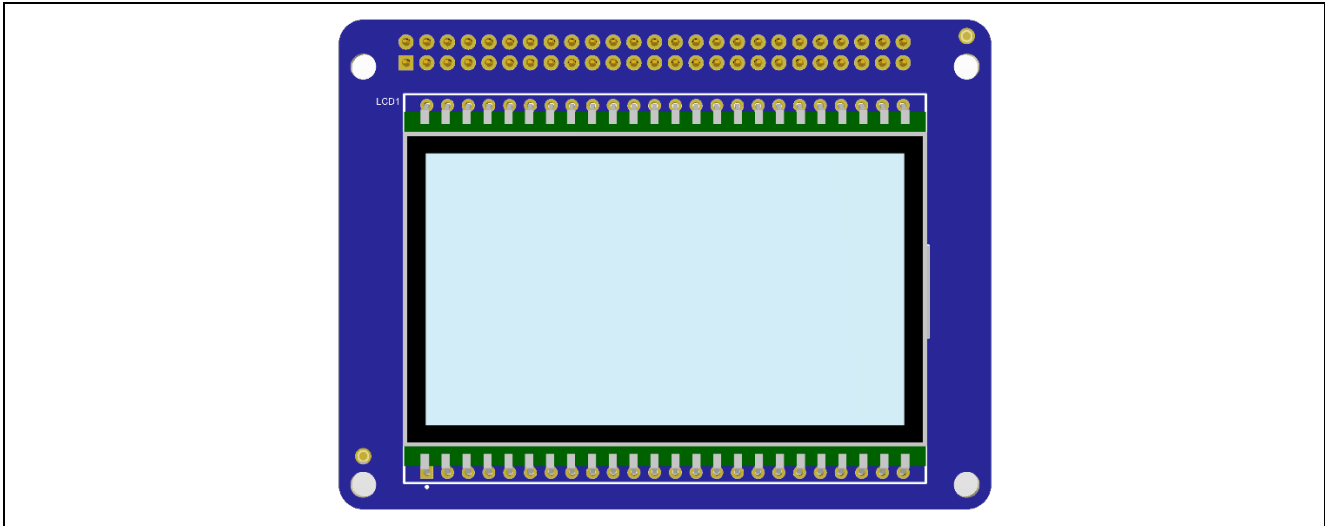


Figure 1. Segment LCD Application Board Top Side

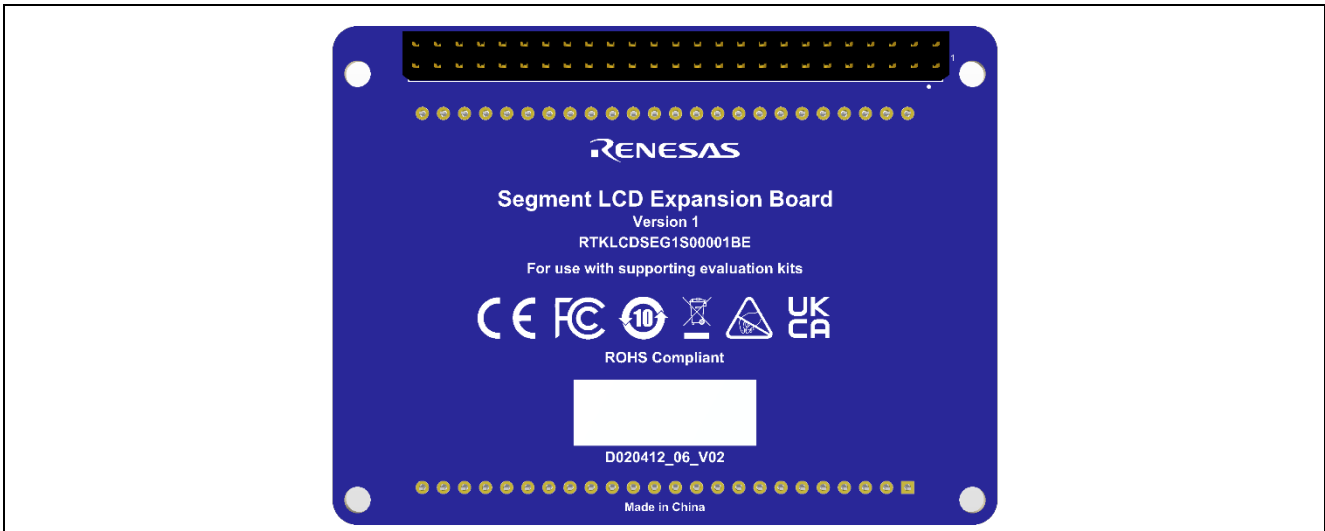


Figure 2. Segment LCD Application Board Bottom Side

## 1.1 Assumptions and Advisory Notes

1. It is assumed the user has an EK-RA4L1, EK-RA4C1 or similar MCU to add LCD functionality, this board cannot be programmed directly.
2. It is assumed that the user has a basic understanding of microcontrollers and embedded systems hardware.
3. It is recommended that the user refers to the Quick Start Example Project that is pre-programmed on the EK-RA4 board.
4. Flexible Software Package (FSP) and e<sup>2</sup> studio, an Integrated Development Environment (IDE), are required to develop embedded applications on the EK-RA4 boards with a connected APP\_LCD board. These can be downloaded from the Renesas website.
5. Instructions to download and install software, import example projects, build them, and program the EK-RA4 board are provided in the Quick Start Guide.

## 2. Kit Contents

The following components are included in the kit.

1. Segment LCD Application Board v1

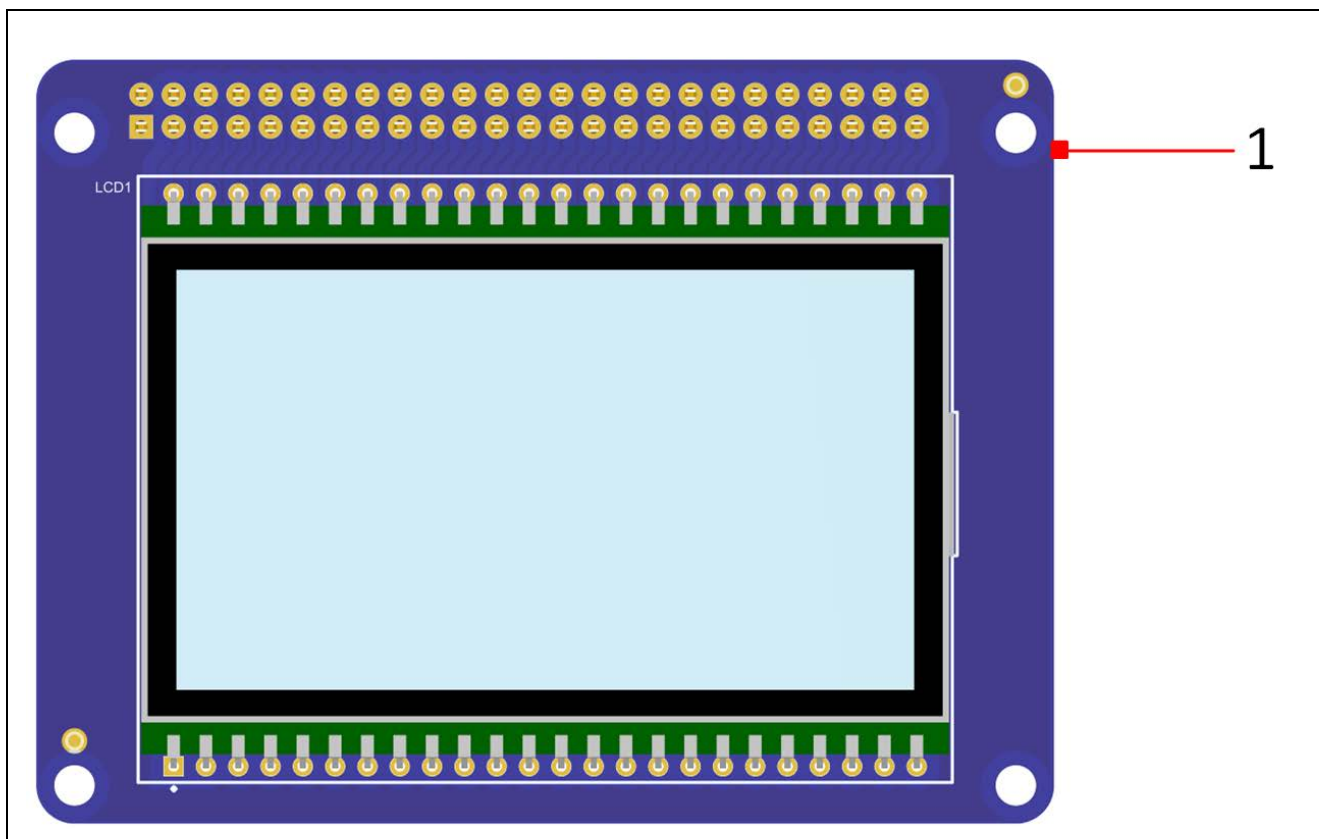


Figure 3. Segment LCD Application Board Kit Contents

## 3. Ordering Information

- Segment LCD Application Board v1 kit orderable part number: RTKSEGLCD1C00001BE
- Segment LCD Application Board dimensions: 80 mm (width) x 60 mm (length)

### 3.1 System Block Diagram

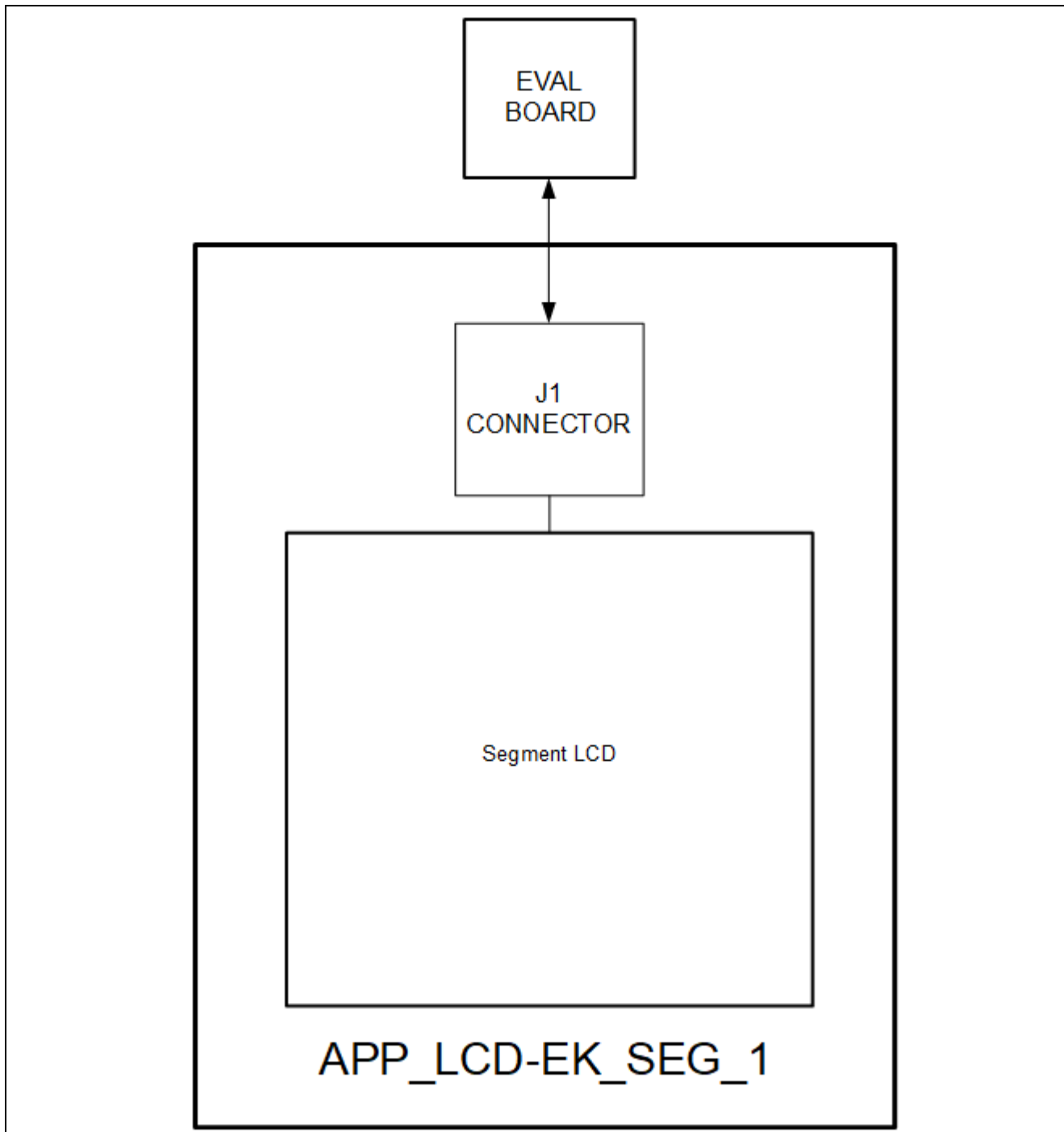


Figure 4. Segment LCD Application Board Block Diagram

### 3.2 Segment Connection

The Segment LCD Application Board provides a connector, J1, to interface with the EK-RA4 board. This connects the Segment LCD to the 'Segment LCD Board Interface' on the eval board. For the EK-RA4L1, this is also referred to as J2 – this may be different for other RA boards.

It is attached using adhesive pads.

**Table 1. Segment Board Connector (J1)**

Segment Board Connector		APP_LCD-EK_SEG_1
J1 Pin	Segment Net Name	Signal Description
1	GND	GND
2	GND	GND
3	COM1	Common Driver 1
4	T7_1F_1G_1E	Signal Strength Bar 1 / SISD digit 1
5	COM2	Common Driver 2
6	T8_1B_1K_1C	Signal Strength Bar 2 / SISD digit 1
7	COM3	Common Driver 3
8	T9_2F_2G_2E	Signal Strength Bar 3 / SISD digit 2
9	COM4	Common Driver 4
10	T10_2B_2K_2C	Signal Strength Bar 4 / SISD digit 2
11	1H_1I_1N_1D	SISD digit 1
12	T11_3F_3G_3E	Signal Strength Bar 5 / SISD digit 3
13	1A_1J_1M_1L	SISD digit 1
14	T12_3B_3K_3C	Signal Strength Bar 6 / SISD digit 3
15	2H_2I_2N_2D	SISD digit 2
16	T6_4F_4G_4E	"mmHg" Segment / SISD digit 4
17	2A_2J_2M_2L	SISD digit 2
18	T5_4B_4K_4C	"mg/mL" Segment / SISD digit 4
19	3H_3I_3N_3D	SISD digit 3
20	T3_5F_5G_5E	"FAN" Segment / SISD digit 5
21	3A_3J_3M_3L	SISD digit 3
22	T4_5B_5K_5C	"Zone" Segment / SISD digit 5
23	4H_4I_4N_4D	SISD digit 4
24	T13_6F_6G_6E	"Volts" Segment / SISD digit 6
25	4A_4J_4M_4L	SISD digit 4
26	T15_6B_6K_6C	Heart sign Segment / SISD digit 6
27	5H_5I_5N_5D	SISD digit 5
28	T2_14E_14G_14F	Cool sign Segment / SSD medium digit 14
29	5A_5J_5M_5L	SISD digit 5
30	14D_14C_14B_14A	SSD medium digit 14
31	6H_6I_6N_6D	SISD digit 6
32	T1_13E_13G_13F	Heat sign Segment / SSD medium digit 13
33	6A_6J_6M_6L	SISD digit 6
34	13D_13C_13B_13A	SSD medium digit 13
35	7F_7G_7E_T14	SSD Large digit 7
36	X1_12E_12G_12F	Sunday sign Segment/ SSD medium digit 12
37	7A_7B_7C_7D	SSD Large digit 7
38	12D_12C_12B_12A	SSD medium digit 12
39	8F_8G_8E_T18	SSD Large digit 8
40	DP2_COL_X3_X2	Decimal Point 2/ Time colon sign / Monday / Tuesday sign
41	8A_8B_8C_8D	SSD Large digit 8
42	X4_11E_11G_11F	Wednesday sign Segment / SSD medium digit 11

Segment Board Connector		APP_LCD-EK_SEG_1
J1 Pin	Segment Net Name	Signal Description
43	9F_9G_9E_DP1	SSD Large digit 9
44	11D_11C_11B_11A	SSD medium digit 11
45	9A_9B_9C_9D	SSD Large digit 9
46	X5_10E_10G_10F	Thursday sign Segment / SSD medium digit 10
47	L5_PM_T16_T17	Battery icon / PM time sign / Celsius Symbol / Fahrenheit Symbol
48	10D_10C_10B_10A	SSD medium digit 10
49	L1_L2_L3_L4	Battery icon charging stage
50	AM_T19_X7_X6	AM time sign / ALARM Sign / Friday / Saturday sign

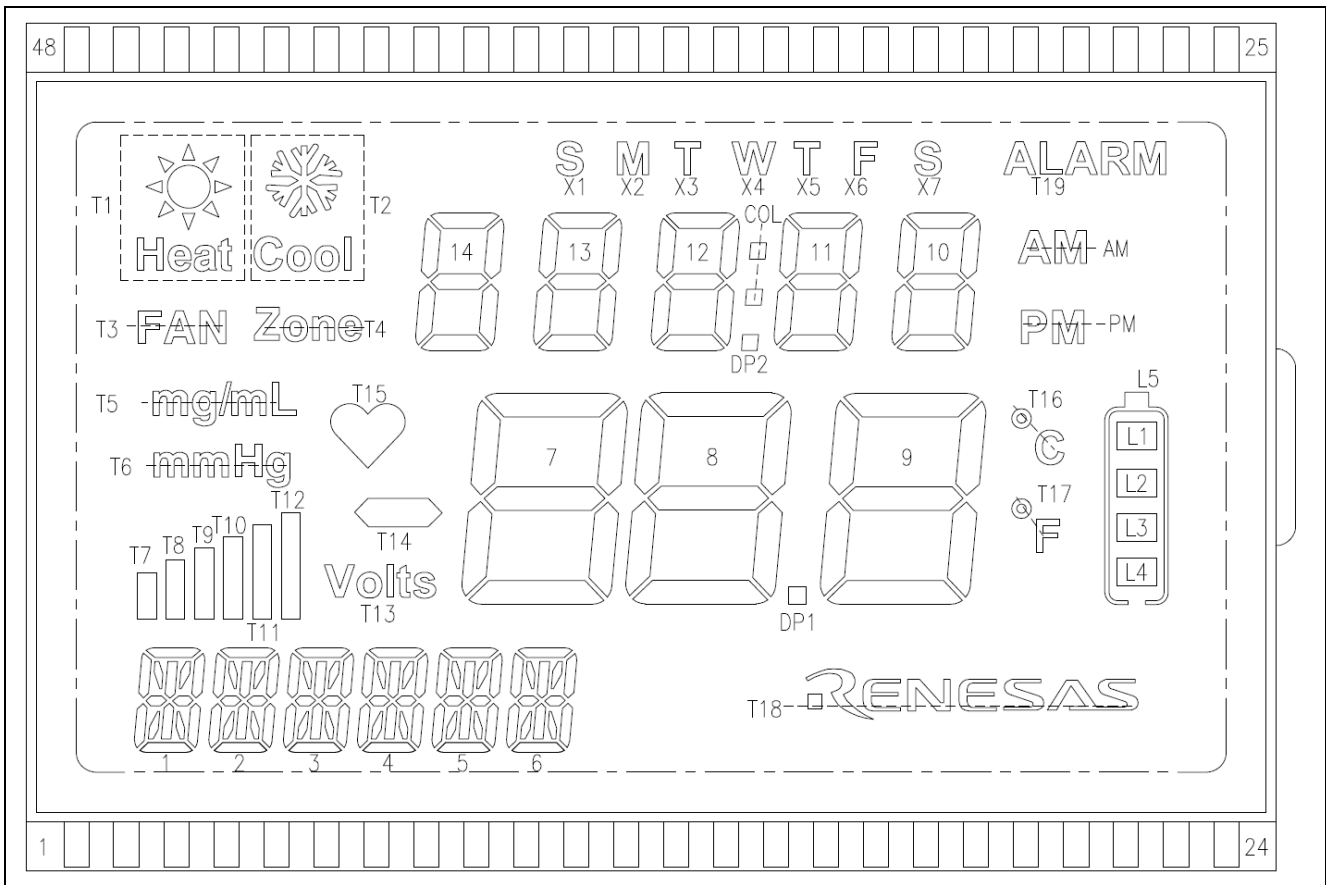


Figure 5. Segment LCD Pin Area Allocation

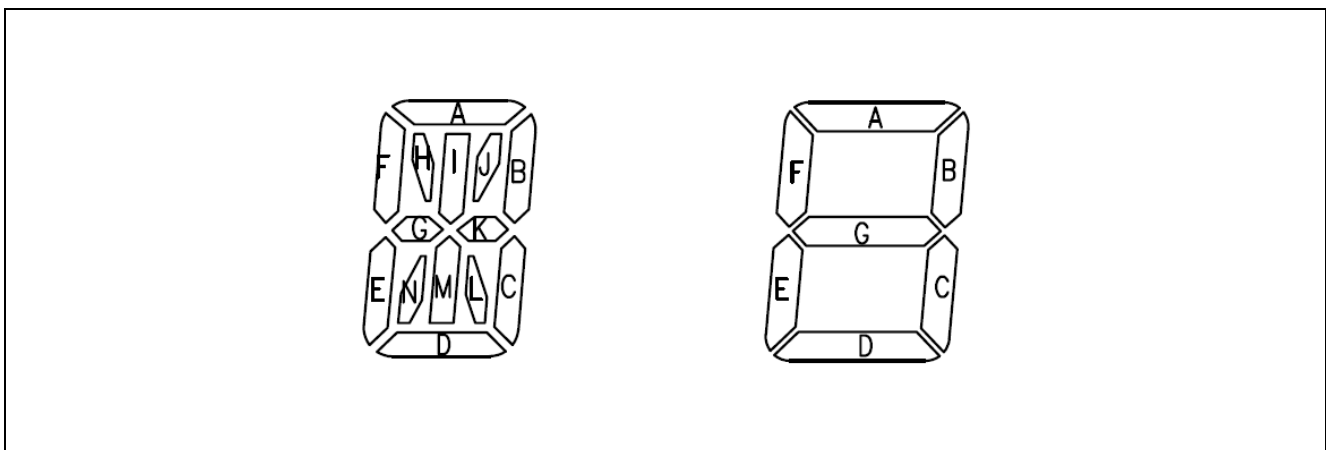


Figure 6. Segment LCD SISD and SSD Allocation

## 4. Certifications

The Segment LCD Application Board v1 kit meets the following certifications/standards. See page 3 of this user's manual for the disclaimer and precautions.

### 4.1 EMC/EMI Standards

- FCC Notice (Class A)



This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

NOTE- This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/television technician for help.

- Innovation, Science and Economic Development Canada ICES-003 Compliance:

CAN ICES-3 (A)/NMB-3(A)

- CE Class A (EMC)



This product is herewith confirmed to comply with the requirements set out in the Council Directives on the Approximation of the laws of the Member States relating to Electromagnetic Compatibility Directive 2014/30/EU.

**Warning** – This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures to correct this interference.

- UKCA Class A (EMC)



This product is in conformity with the following relevant UK Statutory Instrument(s) (and its amendments): 2016 No. 1091 Electromagnetic Compatibility Regulations 2016.

**Warning** – This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures to correct this interference.

- Taiwan: Chinese National Standard 13438, C6357 compliance, Class A limits
- Australia/New Zealand AS/NZS CISPR 32:2015, Class A

### 4.2 Material Selection, Waste, Recycling and Disposal Standards

- EU RoHS
- WEEE
- China SJ/T 113642014, 10-year environmental protection use period.

### 4.3 Safety Standards

- UL 94V-0

## 5. Design and Manufacturing Information

The design and manufacturing information for the APP\_LCD-EK\_SEG\_1 is available in the “EK-RA4L1 v1 Design Package” available on [renesas.com/ek-ra4l1](https://www.renesas.com/ek-ra4l1).

- Design package file name: slcd-v1-designpackage.zip

**Table 2. Segment LCD Application Board Design Package Contents**

File Type	Content	File/Folder Name
File (PDF)	Schematics	slcd-v1-schematics
File (PDF)	Mechanical Drawing	slcd-v1-mechdwg
File (PDF)	3D Drawing	slcd-v1-3d
File (PDF)	BOM	slcd-v1-bom
Folder	Manufacturing Files	Manufacturing Files
Folder	Design Files	Design Files-Altium

## 6. Website and Support

Visit the following URLs to learn about the kit and the RA family of microcontrollers, download tools and documentation, and get support.

EK-RA4L1 Resources	<a href="https://www.renesas.com/ek-ra4l1">renesas.com/ek-ra4l1</a>
RA Product Information	<a href="https://www.renesas.com/ra">renesas.com/ra</a>
RA Product Support Forum	<a href="https://www.renesas.com/ra/forum">renesas.com/ra/forum</a>
Renesas Support	<a href="https://www.renesas.com/support">renesas.com/support</a>

**Revision History**

Rev.	Date	Description	
		Page	Summary
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