User's Manual

32

R-Car Salvator Board X(S) System Evaluation Board

R-Car
CAN Extension Board

User's Manual: Hardware

Y-RCAR-CAN-EXT-BRD

The newest version of this document can always be obtained from the following web location:
Y-RCAR-CAN-EXT-BRD Documents

Notice

1. All information included in this document is current as of the date this document is issued. Such information, however, is subject to change without any prior notice. Before purchasing or using any Renesas Electronics products listed herein, please confirm the latest product information with a Renesas Electronics sales office. Also, please pay regular and careful attention to additional and different information to be disclosed by Renesas Electronics such as that disclosed through our website.
2. Renesas Electronics does not assume any liability for infringement of patents, copyrights, or other intellectual property rights of third parties by or arising from the use of Renesas Electronics products or technical information described in this document. No license, express, implied or otherwise, is granted hereby under any patents, copyrights or other intellectual property rights of Renesas Electronics or others.
3. You should not alter, modify, copy, or otherwise misappropriate any Renesas Electronics product, whether in whole or in part.
4. Descriptions of circuits, software and other related information in this document are provided only to illustrate the operation of semiconductor products and application examples. You are fully responsible for the incorporation of these circuits, software, and information in the design of your equipment. Renesas Electronics assumes no responsibility for any losses incurred by you or third parties arising from the use of these circuits, software, or information.
5. When exporting the products or technology described in this document, you should comply with the applicable export control laws and regulations and follow the procedures required by such laws and regulations. You should not use Renesas Electronics products or the technology described in this document for any purpose relating to military applications or use by the military, including but not limited to the development of weapons of mass destruction. Renesas Electronics products and technology may not be used for or incorporated into any products or systems whose manufacture, use, or sale is prohibited under any applicable domestic or foreign laws or regulations.
6. Renesas Electronics has used reasonable care in preparing the information included in this document, but Renesas Electronics does not warrant that such information is error free. Renesas Electronics assumes no liability whatsoever for any damages incurred by you resulting from errors in or omissions from the information included herein.
7. Renesas Electronics products are classified according to the following three quality grades: "Standard", "High Quality", and "Specific". The recommended applications for each Renesas Electronics product depends on the product's quality grade, as indicated below. You must check the quality grade of each Renesas Electronics product before using it in a particular application. You may not use any Renesas Electronics product for any application categorized as "Specific" without the prior written consent of Renesas Electronics. Further, you may not use any Renesas Electronics product for any application for which it is not intended without the prior written consent of Renesas Electronics. Renesas Electronics shall not be in any way liable for any damages or losses incurred by you or third parties arising from the use of any Renesas Electronics product for an application categorized as "Specific" or for which the product is not intended where you have failed to obtain the prior written consent of Renesas Electronics.

   The quality grade of each Renesas Electronics product is "Standard" unless otherwise expressly specified in a Renesas Electronics data sheets or data books, etc.

   "Standard": Computers; office equipment; communications equipment; test and measurement equipment; audio and visual equipment; home electronic appliances; machine tools; personal electronic equipment; and industrial robots.

   "High Quality":Transportation equipment (automobiles, trains, ships, etc.); traffic control systems; anti-disaster systems; anti- crime systems; safety equipment; and medical equipment not specifically designed for life support.

   "Specific": Aircraft; aerospace equipment; submersible repeaters; nuclear reactor control systems; medical equipment or systems for life support (e.g. artificial life support devices or systems), surgical implantations, or healthcare intervention (e.g. excision, etc.), and any other applications or purposes that pose a direct threat to human life.
8. You should use the Renesas Electronics products described in this document within the range specified by Renesas Electronics, especially with respect to the maximum rating, operating supply voltage range, movement power voltage range, heat radiation characteristics, installation and other product characteristics. Renesas Electronics shall have no liability for malfunctions or damages arising out of the use of Renesas Electronics products beyond such specified ranges.
9. Although Renesas Electronics endeavors to improve the quality and reliability of its products, semiconductor products have specific characteristics such as the occurrence of failure at a certain rate and malfunctions under certain use conditions. Further, Renesas Electronics products are not subject to radiation resistance design. Please be sure to implement safety measures to guard them against the possibility of physical injury, and injury or damage caused by fire in the event of the failure of a Renesas Electronics product, such as safety design for hardware and software including but not limited to redundancy, fire control and malfunction prevention, appropriate treatment for aging degradation or any other appropriate measures. Because the evaluation of microcomputer software alone is very difficult, please evaluate the safety of the final products or system manufactured by you.
10. Please contact a Renesas Electronics sales office for details as to environmental matters such as the environmental compatibility of each Renesas Electronics product. Please use Renesas Electronics products in compliance with all

applicable laws and regulations that regulate the inclusion or use of controlled substances, including without limitation, the EU RoHS Directive. Renesas Electronics assumes no liability for damages or losses occurring as a result of your noncompliance with applicable laws and regulations.

11. This document may not be reproduced or duplicated, in any form, in whole or in part, without prior written consent of Renesas Electronics.
12. Please contact a Renesas Electronics sales office if you have any questions regarding the information contained in this document or Renesas Electronics products, or if you have any other inquiries.

(Note 1) "Renesas Electronics" as used in this document means Renesas Electronics Corporation and also includes its majority-owned subsidiaries.

(Note 2) "Renesas Electronics product(s)" means any product developed or manufactured by or for Renesas Electronics.

Renesas Electronics Corporation

www.renesas.com

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. 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 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 a product with a different part number, confirm that the change will not lead to problems.

   – The characteristics of Microprocessing unit or Microcontroller unit products in the same group but having a different part number may differ in terms of the 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.

Table of Contents

1. Introduction

The R-Car CAN Extension Board is part of the R-Car Salvator X(S) Evaluation Board System and serves as a simple and easy to use platform for evaluating features and performance of Renesas Electronics' R-Car H3, M3-W, or M3-N SiPs. The CAN Extension Board is an add-on board for the Salvator-X(S) boards to provide two CAN/CANFD interfaces. It cannot be used as a standalone board. It can only be used together with a Salvator X(S) board connected via the CN28 connector. The power is supplied from Salvator-X(S) board via 7pin cable to the CAN Extension Board power connector.

Notes

1. This document describes the functionality of the R-Car CAN extension board and guides the user through its operation.
   For details regarding the operation of the R-Car SoC, refer to the device's Hardware User's Manual.
2. In this document low active signals are marked by an appended 'Z' to the pin or signal name. E.g., the reset pin is named RESETZ.
3. In this document following abbreviations are used:
   - H level, L level: high or low signal level of a digital signal, the absolute voltage value depends on the signal

1.1 Package Components

The Y-RCAR-CAN-EXT-BRD product package consists of the following items. After you have unpacked the box, check if your Y-RCAR-CAN-EXT-BRD package contains all these items. *Table 1.1 Package Components for the Y-RCAR-CAN-EXT-BRD* shows the packing components of the Y-RCAR-CAN-EXT-BRD package.

Table 1.1 Package Components for the Y-RCAR-CAN-EXT-BRD

Item	Description	Quantity
D017688	CAN Extension board for the R-Car H3, M3-W, or M3-N Salvator-X(S) board	1
D010816-24	China RoHS document	1
D017688-24	Product contents list	1
D017460-04-V02	CAN Extension board schematic printout	43
JST PHR 7-pin power connection cable	In the bag	1

Note

Please keep the Y-RCAR-CAN-EXT-BRD packing box at hand for later reuse in sending the product for repairs or for other purposes. Always use the original packing box when transporting the Y-RCAR-CAN-EXT-BRD. If packing of your product is not complete, it may be damaged during transportation.

1.2 Supported Salvator X(S) Boards

This CAN Extension board cannot be used as a standalone board, it can only be used in combination with an R-Car H3, M3-W, or M3-N Salvator X(S) evaluation board. The following Salvator X(S) boards are supported:

- Y-R-CAR-H3-SIP-BOARD-SKT-xxxx
- Y-R-CAR-M3-SIP-BOARD-SKT-xxxx
- Y-R-CAR-M3N-SIP-BOARD-SKT-xxxx

1.3 Main Features

- 2 CAN Channels
    - IF0 using R-Car H3, M3-W, or M3-N CAN(FD)0_TX_A and CAN(FD)0_RX_A
    - IF1 using R-Car H3, M3-W, or M3-N CAN(FD)1_TX_A and CAN(FD)1_RX_A
- Operating temperature from 0 °C to +40 °C

1.4 R-Car CAN Extension Board Views

Following figures provide a top view of the R-Car CAN Extension board and a system view with a Salvator X(S) board.

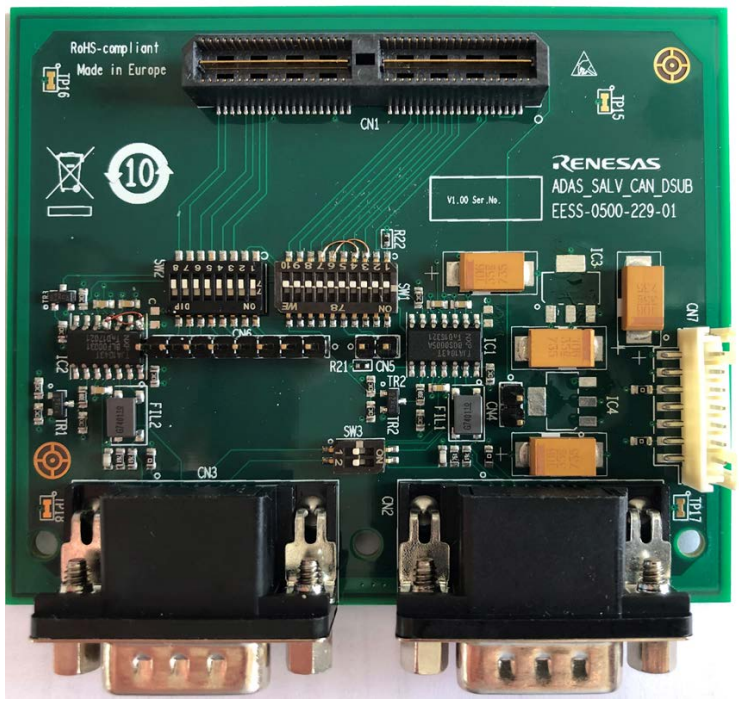


Figure 1.1 R-Car CAN Extension Board top view

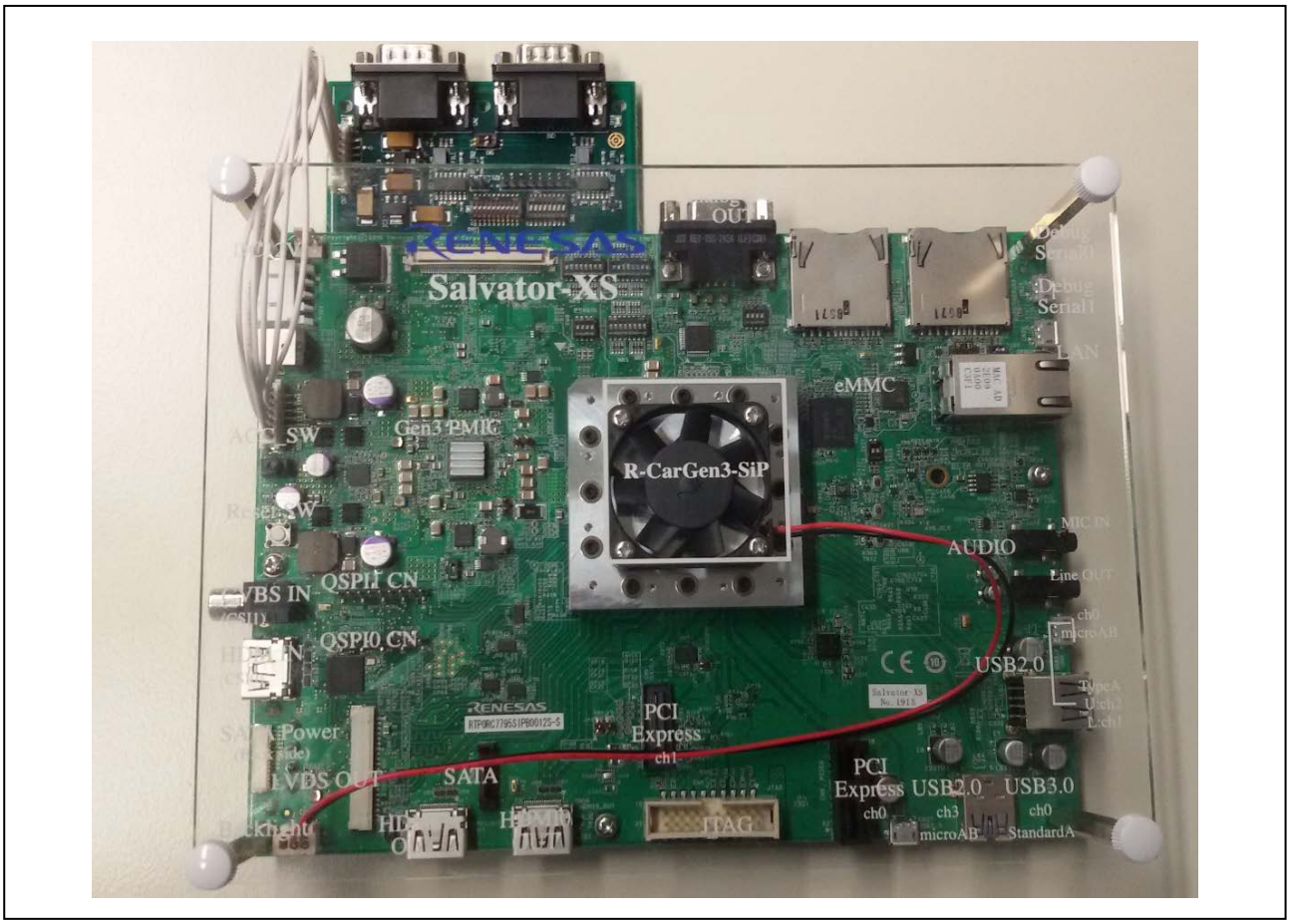


Figure 1.2 System View Salvator X(S)- and CAN Extension Board

2. DIP Switches

This section provides the CAN Extension Board DIP switch setting need to use both CAN interfaces.

The placement of these components on the board is depicted in the figure below.

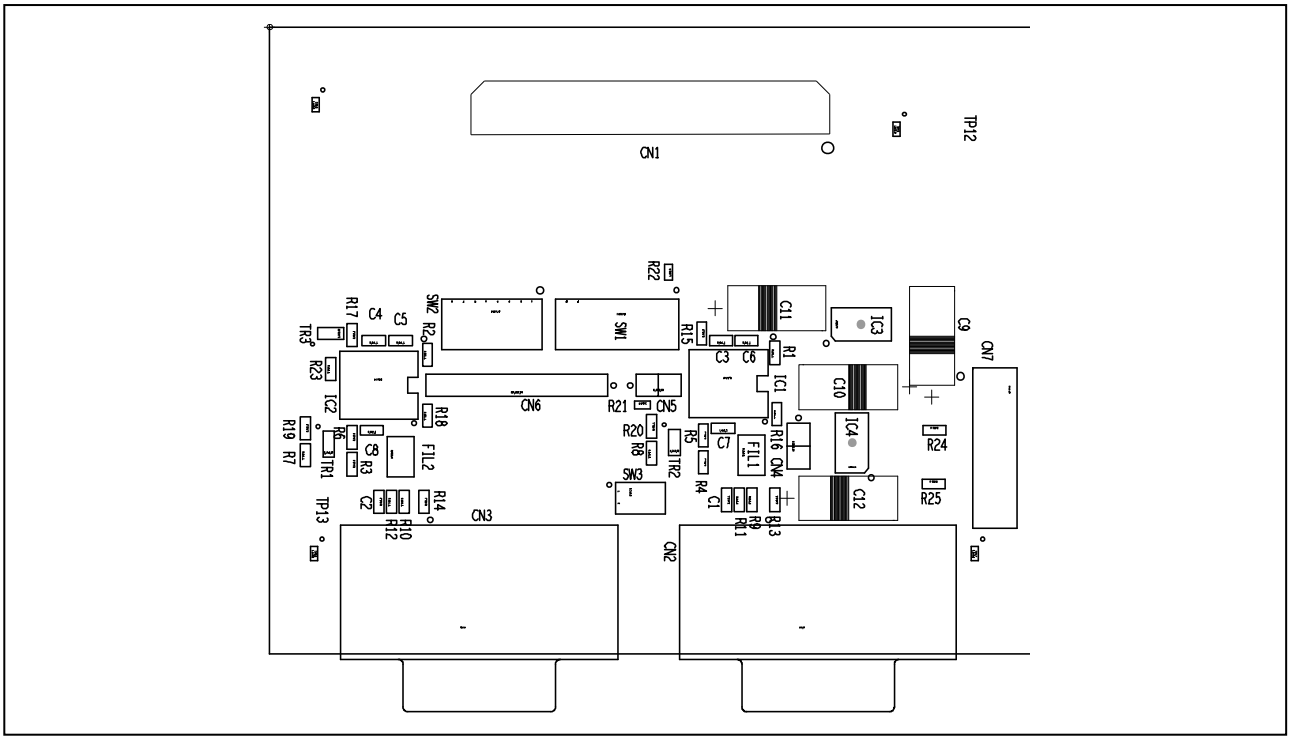


Figure 2.1 Placement of DIP Switch and Connectors

2.1 DIP Switch SW1 Overview

The following table provides an overview of DIP switch SW1

Table 2.1 SW1 Overview

Switch	Function	Setting to use both CAN Interfaced
1	Power Control (wake up on CAN)	*OFF*
2	CAN0 Tx pin	*ON*
3	CAN0 Transceiver EN pin mapped to SoC GP1_12	*ON*
4	CAN0 Transceiver STB_EN pin mapped to SoC GP1_11	*ON*
5	---	*OFF*
6	CAN1 Transceiver EN pin mapped to SoC GP1_12	*ON*
7	CAN1 Transceiver STB_EN pin mapped to SoC GP1_11	*ON*
8	---	*OFF*

2.2 Connectors Overview

The following table provides an overview of all connectors.

Table 2.2 Connector overview

Connector	Function	Remark
CN1	Salvator X(S) Board connector	
CN2	CAN Connector IF0	
CN3	CAN Connector IF1	
CN7	Power Connector	

3. Connectors

3.1 Connectors to the Salvator X(S) Board CN1 and CN7

The connectors CN1 and CN7 are available to connect the CAN Extension board to a Salvator X(S) Board.

The signals of each connector are summarized in the following tables.

3.1.1 Salvator X(S) Board Connector

Pin	CAN Extension Board function
1	n.c.
3,7,17	GND
5, 9	n.c.
11	CANFD0_TX / SCL6
13	CANFD1_RX
15	n.c.
19	GP1_12
21	GP1_11
23	GP1_10
25	n.c.
27	SDA6
29	GP1_07
31	GP1_06
33	GP1_05
35 – 43	n.c.
45	GND
47 -61	n.c.
63	GND
65	TXD2
67	RXD2
69	SYNC2
71	SCK2
73 – 77	n.c.
81 - 87	GND

Pin	Main Board function
2	n.c.
4,8,18	GND
6,10	n.c.
12	GND
14	CANFD1_TX
16 -26	n.c.
28	PRESET
30-44	n.c.
46	GND
48	CANFD0_RX
50 - 52	n.c.
54	GND
56	n.c.
58	GND
60 – 66	n.c.
68	EX_PWRON
70 - 80	n.c.
82 – 88	GND

3.1.2 Power Connector CN7

Pin	Function
1	12 V
2	GND
3	5 V
4	n.c.
5	GND
6	3.3 V
7	n.c.

3.2 CAN Interface Connector CN2 and CN3

CN2 (IFO)	
Pin	**Function**
1	n.c.
2	MCANL0
3	GND via Pulldown 0 Ω
4	*n.c.*
5	*n.c.*
6	n.c.
7	MCANH0
8	n.c.
9	n.c.
10	GND
11	GND

CN3(IF1)	
Pin	**Function**
1	n.c.
2	MCANL1
3	GND via Pulldown 0 Ω
4	n.c.
5	n.c.
6	n.c.
7	MCANH1
8	n.c.
9	n.c.
10	GND
11	GND

4. Linux Bring Up and Restrictions

4.1 Linux Bring Up

To use the board with Linux, both the transceivers need to be enabled to switch from Normal state to the default standby state. Please check the README file of the zip-archive ‘can-ext-board_Vxxxx’ available at:

http://www.renesas.eu/update?oc=Y-RCAR-CAN-EXT-BRD#packageInfo

4.2 Restrictions of the CAN Extension Board V1.00

Please notice the following restrictions:

a) JTAG and CAN0 co-existence: JTAG and the CAN board (CAN0 usage) cannot work together

b) DU and CAN0 co-existence: DU and CAN0 may not work together as the CAN0 transceiver pin clashes with DU

4.3 Rework

CAN(FD)1_TX & CAN(FD)1_RX pins: The Rx and Tx pins are swapped, and the board is reworked for this issue

5. Mechanical Dimensions

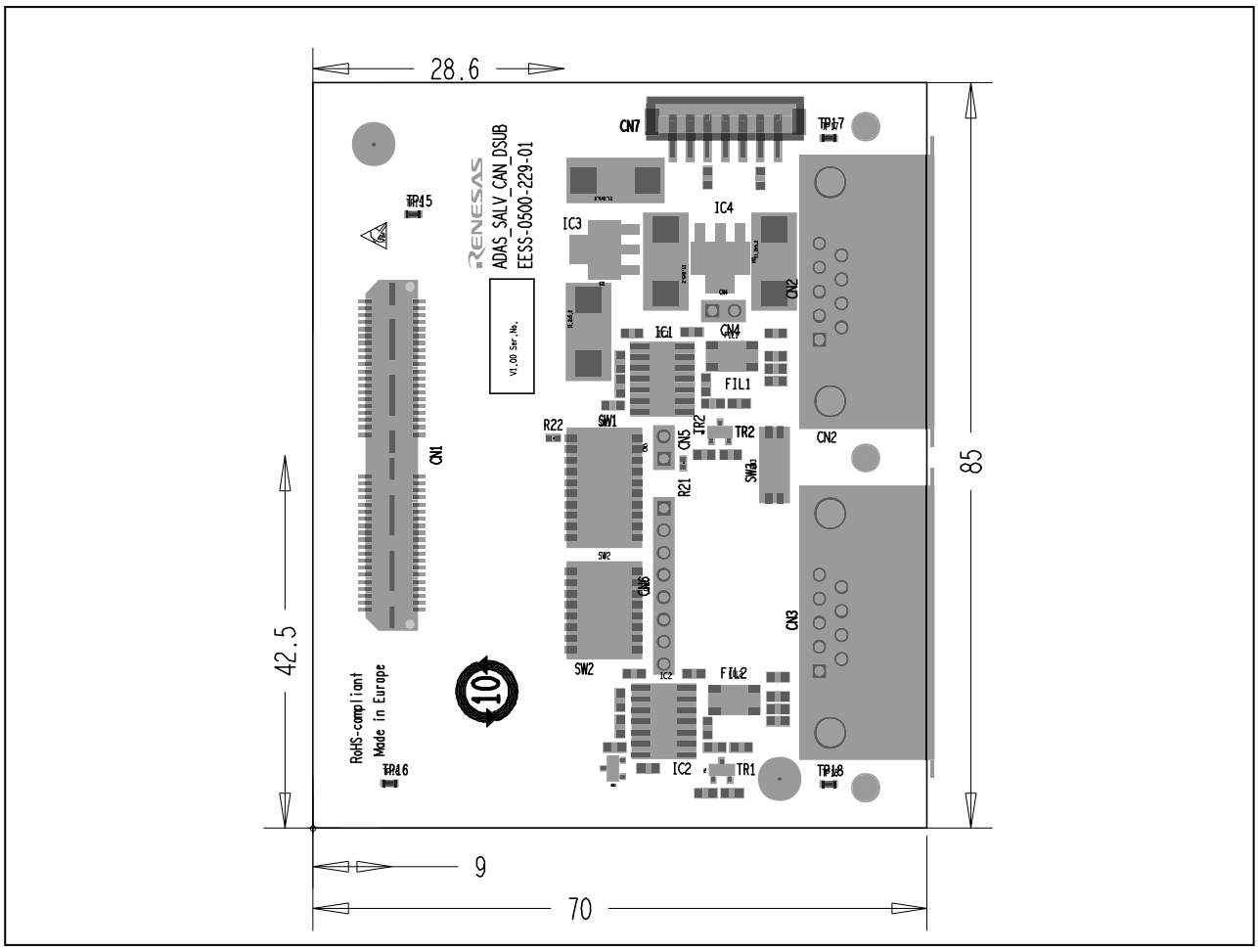
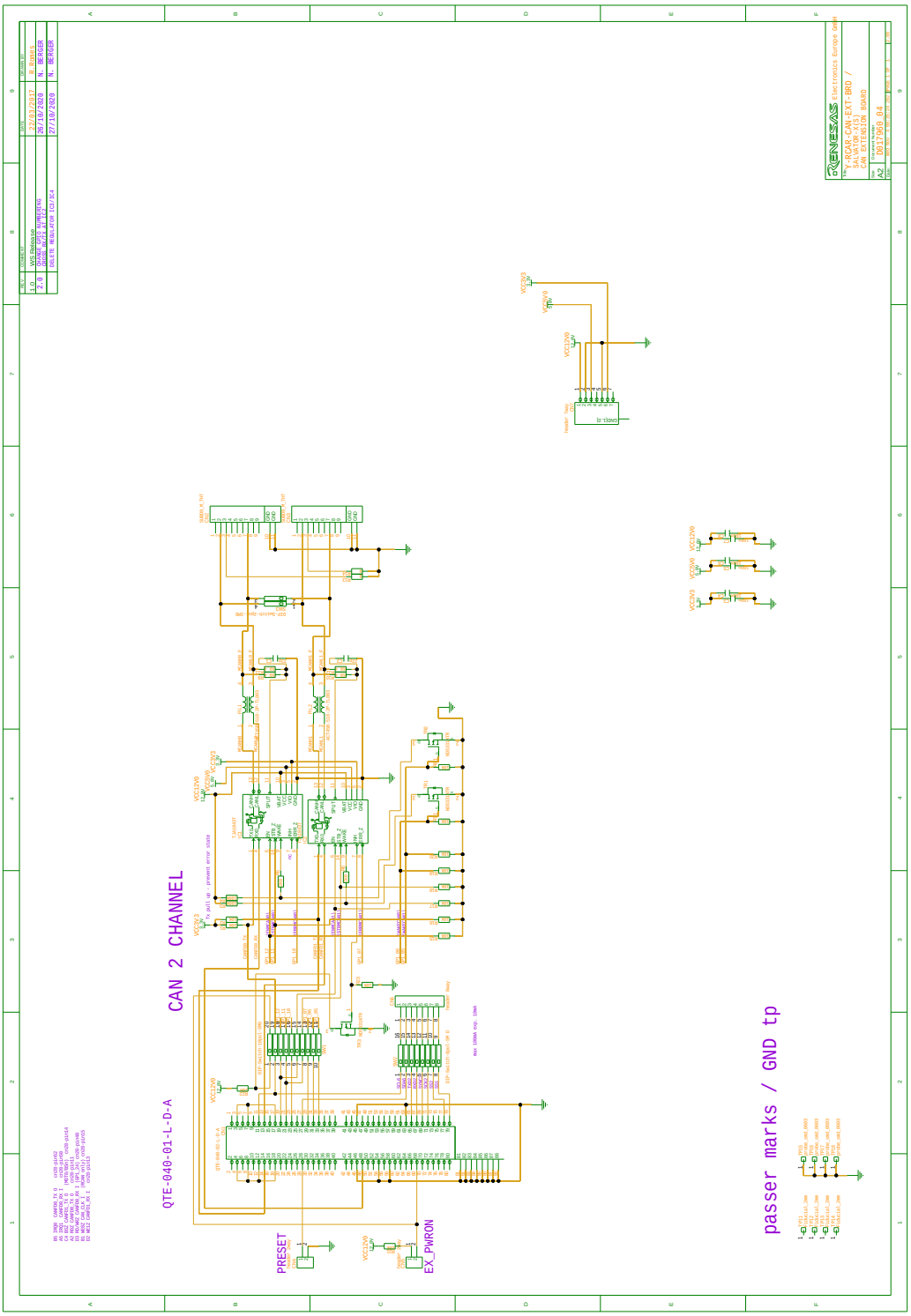


Figure 5.1 Mechanical dimensions

6. Schematics

CAUTION

The schematics shown in this document are not intended to be used as a reference for mass production. Any usage in an application design is in sole responsibility of the customer.



Revision History

		Description	
Rev.	**Date**	**Page**	**Summary**
V1.00	August 16, 2021	–	Initial release

R-Car CAN Extension Board User's Manual: Hardware

Publication Date: Rev.1.00 August 16, 2021

Published by: Renesas Electronics Corporation

SALES OFFICES Renesas Electronics Corporation http://www.renesas.com

Refer to "http://www.renesas.com/" for the latest and detailed information.

Renesas Electronics Corporation
TOYOSU FORESIA, 3-2-24 Toyosu, Koto-ku, Tokyo 135-0061, Japan

Renesas Electronics America Inc.
1001 Murphy Ranch Road, Milpitas, CA 95035, U.S.A.
Tel: +1-408-432-8888, Fax: +1-408-434-5351

Renesas Electronics Canada Limited
9251 Yonge Street, Suite 8309 Richmond Hill, Ontario Canada L4C 9T3
Tel: +1-905-237-2004

Renesas Electronics Europe GmbH
Arcadiastrasse 10, 40472 Düsseldorf, Germany
Tel: +49-211-6503-0, Fax: +49-211-6503-1327

Renesas Electronics (China) Co., Ltd.
Room 101-T01, Floor 1, Building 7, Yard No. 7, 8th Street, Shangdi, Haidian District, Beijing 100085, China
Tel: +86-10-8235-1155, Fax: +86-10-8235-7679

Renesas Electronics (Shanghai) Co., Ltd.
Unit 301, Tower A, Central Towers, 555 Langao Road, Putuo District, Shanghai 200333, China
Tel: +86-21-2226-0888, Fax: +86-21-2226-0999

Renesas Electronics Hong Kong Limited
Unit 1601-1611, 16/F., Tower 2, Grand Century Place, 193 Prince Edward Road West, Mongkok, Kowloon, Hong Kong
Tel: +852-2265-6688, Fax: +852 2886-9022

Renesas Electronics Taiwan Co., Ltd.
13F, No. 363, Fu Shing North Road, Taipei 10543, Taiwan
Tel: +886-2-8175-9600, Fax: +886 2-8175-9670

Renesas Electronics Singapore Pte. Ltd.
80 Bendemeer Road, Unit #06-02 Hyflux Innovation Centre, Singapore 339949
Tel: +65-6213-0200, Fax: +65-6213-0300

Renesas Electronics Malaysia Sdn.Bhd.
Unit No 3A-1 Level 3A Tower 8 UOA Business Park, No 1 Jalan Pengaturcara U1/51A, Seksyen U1, 40150 Shah Alam, Selangor, Malaysia
Tel: +60-3-5022-1288, Fax: +60-3-5022-1290

Renesas Electronics India Pvt. Ltd.
No.777C, 100 Feet Road, HAL 2nd Stage, Indiranagar, Bangalore 560 038, India
Tel: +91-80-67208700

Renesas Electronics Korea Co., Ltd.
17F, KAMCO Yangjae Tower, 262, Gangnam-daero, Gangnam-gu, Seoul, 06265 Korea
Tel: +82-2-558-3737, Fax: +82-2-558-5338

Colophon 6.0

R-Car

Renesas Electronics Corporation

R20UT4860ED0100