User´s Manual

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RH850 Evaluation Platform

RH850/F1KM Emulation-Adapter

Y-RH850-F1KM-EMU-ADAPTER
Y-RH850-F1KX-EA-100PIN
Y-RH850-F1KX-EA-144PIN
Y-RH850-F1KX-EA-176PIN
Y-RH850-F1KX-EA-233PIN
Y-RH850-F1KX-EA-272PIN

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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.

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Chapter 1 Introduction

The RH850/F1KM Emulation-Adapter serves as a tool for trace and emulation purposes of the RH850/F1KM-S4 automotive microcontroller.

Throughout this document the following names will be used:

Target Device:
The µC of the target application that is replaced/emulated by the Emulation-Adapter.

Target Application:
The hardware environment the TargetDevice is operated in.

TargetI/F (TargetInterface):
Pin-header connector on the bottom side of the PCB.

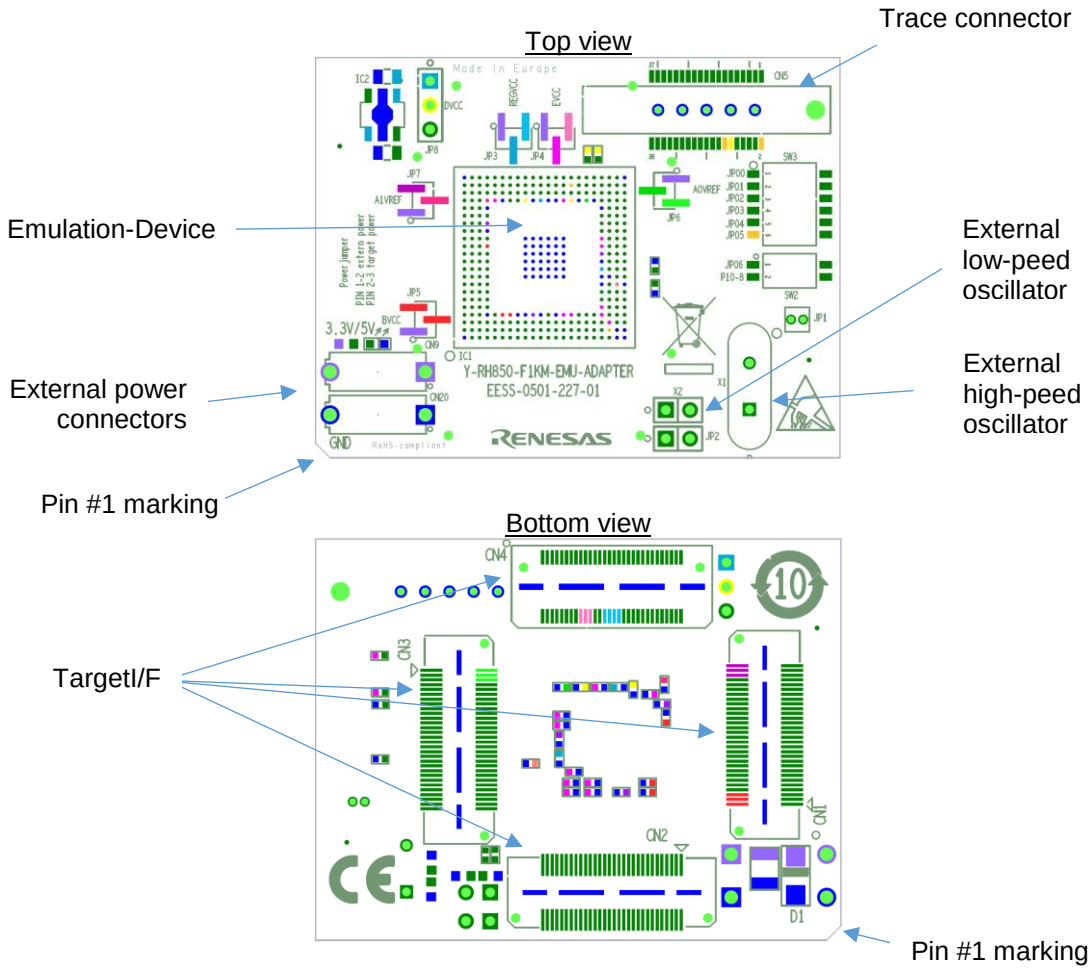
EmulationDevice:
The µC soldered on the top side of the PCB

The Emulation-Adapter can be operated either

- By placing it in the target application or
- by stand-alone operation.

1.1 Board Overview

The figure below provides a view of the Emulation-Adaptor.



Chapter 2 Power Supply

The RH850/F1KM Emulation-Adapter can be configured to use

- either the supply voltage available at the TargetI/F, or
- the voltage supply at the external voltage supply connector.

Details of the board power supply are described in the chapters below.

2.1 External supply voltage connector

For a stand-alone operation the device operation voltage can supplied by the two 2mm lab connectors CN9 (red, supply voltage) and CN20 (black, VSS).

Note:
Do not exceed the RH850/F1KM power supply voltages as specified in the related devices datasheet.

2.2 Voltage configuration

The device supply voltages must be configured for use of either the voltage from the Target-I/F or from the external power supply (VIN). The table below shows the available configurations:

Jumper	Supply of	Position 1-2	Postion 2-3
JP3	REGVCC	Supply voltage from CN9	REGVCC from Target-I/F
JP4	EVCC		EVCC from Target-I/F
JP5	BVCC		BVCC from Target-I/F
JP6	A0VREF		A0VREF from Target-I/F
JP7	A1VREF		A1VREF from Target-I/F
JP8	DVCC 1)	3.3V from selected (by JP3) REGVCC voltage source.	3.3V from onboard voltage regulator IC2

Note 1):
The supply voltage for DVCC must have a value of 3.3V. In case only a voltage >3.3V is available at REGVCC (e.g. 5V), the output of the onboard voltage regulator IC2 must be used to supply the required voltage of 3.3V for DVCC.

Chapter 3 Board connectors

This section describes the connectors that are available on the Emulation Adapter.

3.1 Trace connector CN5

The connector CN5 (38pin Mictor) can be used to connect a trace/debug tool to the device available on the Emulation Adapter.
The table shows the signals on CN5:

CN15 PinNr	CN15 Signal	Device Signal (PinNr)		CN15 PinNr	CN15 Signal	Device Signal (PinNr)
1	MDO12	MDO12 (A6)		2	MDO13	MDO13(A7)
3	MDO14	MDO14(C8)		4	MDO15	MDO15 (A8)
5	MDO09	MDO09 (A4)		6	-	-
7	-	-		8	MDO08	MDO08 (B4)
9	DBG-RESET	_RESET (Y7)		10	EVTI	MSYN (H3)
11	DBG-TDO	LPDO (W4)		12	VTREF	DVCC (F4), (D5)
13	MDO10	MDO10 (C6)		14	DBG-RDY	LPDCLKOUT (W3)
15	DBG-TCK	LPDCLK (U5)		16	MDO07	MDO07(A2)
17	DBG-TMS	DCUTMS (V4)		18	MDO06	MDO06(B1)
19	DBG-TDI	LPDI (V5)		20	MDO05	MDO05 (C2)
21	DBG_TRST	_DCUTRST (Y3)		22	MDO04	MDO04 (C1)
23	MDO11	MDO11 (B6)		24	MDO03	MDO03 (D2)
25	-	-		26	MDO02	MDO02 (E1)
27	-	-		28	MDO01	MDO01 (F2)
29	-	-		30	MDO00	MDO00 (F1)
31	-	-		32	EVTO	JP0_6 (W11)
33	FLMD1	FLMD1 (P10_8)		34	MCKO	MCKO (G1)
35	-	-		36	MSEO1	MSEO1(H2)
37	FLMD0	FLMD0 (V9)		38	MSEO0	MSEO0 (J3)

As a signal of the debug interface might be used in the application on the target board, each of the signals related to the debug connection can be connected/disconnected to the Target-I/F by means of a switch / (jumper).

The table shows the available configurations:

Jumper	Signal on Target-I/F	Signal on trace connector CN5
SW3 1-12	JP0_0	DBG-TDI
SW3 2-11	JP0_1	DBG-TDO

SW3 3-10	JP0_2	DBG-TCK
SW3 4-9	JP0_3	DBG-TMS
SW3 5-8	JP0_4	DBG_TRST
SW3 6-7	JP0_5	DBG-RDY
SW2 1-4	JP0_6	EVTO
SW2 2-3	P10_8	FLMD1

For each signal that is not used for debugging / tracing and is used in the target application, the related switch must be closed.

3.2 Debug-Adapter 14-pin to 38-pin

Instead of the trace tool a debug tool can be used with the Emulation-Adapter board. The connector typically used for RH850 debugging is a 14-pin male connector. Supplied with the Emulation-Adapter is a small PCB with the 38-pin Mictor trace connector on one side and the 14-pin debug connector on the other side.

The table shows the signals available on this ConnectionPCB:

CN1 (14pin)	Signal	CN15 (Mictor 38pin)
1	JP0_2	15
2	GND	GND
3	JP0_4	21
4	FLMD0	37
5	JP0_1	11
6	P10_8 (FLMD1)	33
7	JP0_0	19
8	DVCC	12
9	JP0_3	17
10	-	-
11	JP0_5	14
12	GND	-
13	_Reset	9
14	GND	GND

The schematic of the Debug-Adapter can be found in chapter 4.2.

3.3 External high-speed oscillator

The high speed external oscillator used by the emulation device must be placed on the connector X1.

Two oscillators (8MHz and 16MHz) are supplied with the board

The signals X1/X2 of the emulation device are not connected to the related signals of the target device.

3.4 External low-speed oscillator

The low speed external oscillator used by the emulation device must be placed on the connector X2.

One oscillator or 32.768kHz is supplied with the board.

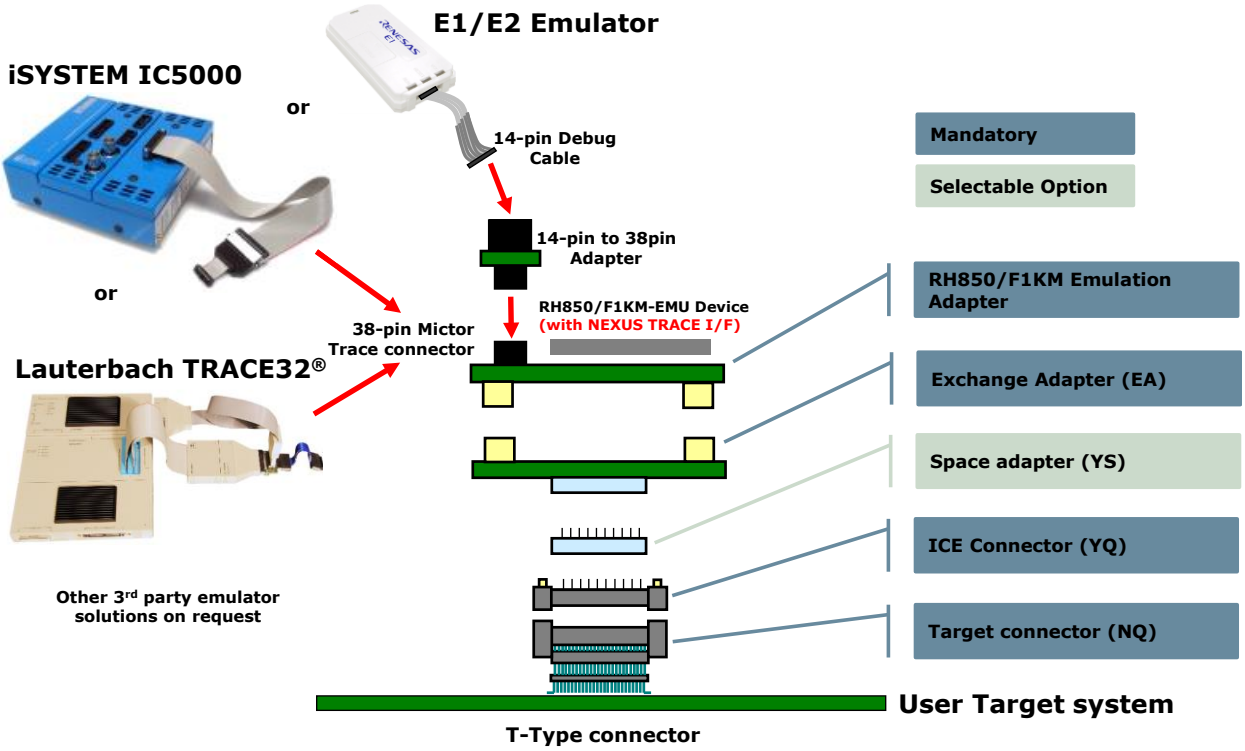
The signal XT1 of the emulation device is connected to the related signal of the target device.

The signal XT2 can be connected to the related signal of the target device by closing the jumper JP2.

3.5 Mounting of Emulation Adapter

3.6 General setup

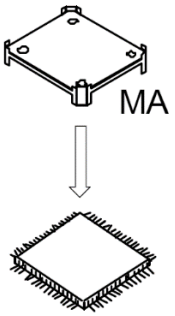
The RH850/F1KM Emulation-Adapter is placed inside the target application using various adapters. The setup is shown in this picture:



When using the Emulation-Adapter the following adapters must be used:

- Exchange Adapter (EA)
- Space Adapter (YS) (optional)
- ICE Connector (YQ)

In case a device shall be placed on the board, a Mount Adapter (MA) can used instead of the ICE Connector (YQ):



Note:

- When connecting the Emulation-Adapter with the Exchange-Adapter be sure to carefully align the connectors of both boards.
  The location of the pin #1 on both boards is marked with a ‘flat edge’. See chapter 1.1 for details.
- When disconnecting the two boards, special attention must be taken not to bend the pin headers when applying the high required forces. Use the supplied screws to shift the two boards apart.

3.7 Available Exchange- and Target-Adapters

The following Exchange-Adapters are available for mounting of the Emulation-Adapter in the related target application:

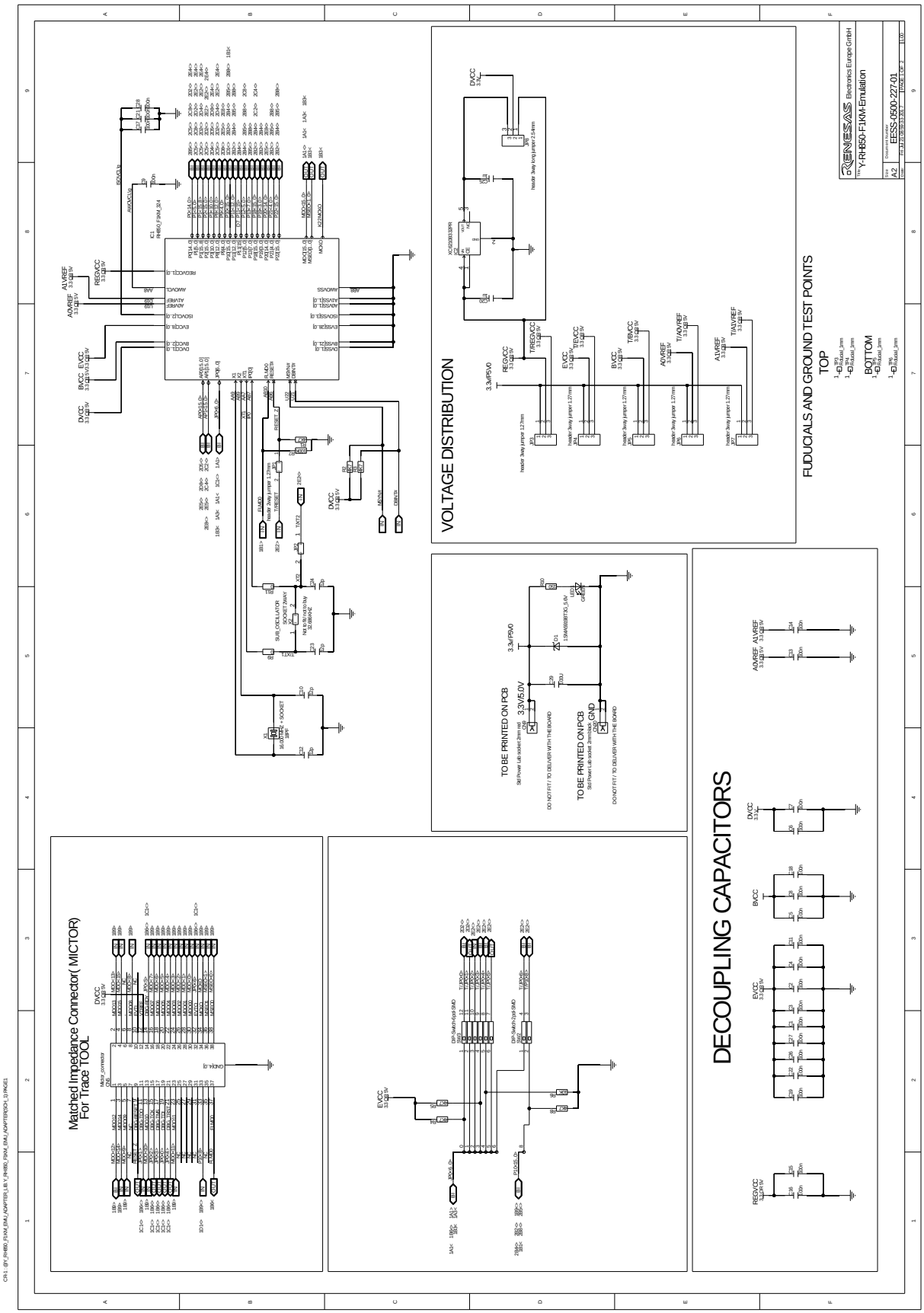
	RH850/F1KM Series				
Tool Component	**100-pin LQFP**	**144-pin LQFP**	**176-pin LQFP**	**233-pin FBGA**	**272-pin FBGA**
Emulation Adapter	Y-RH850-F1KM-EMU-ADAPTER				
Exchange Adapter	Y-RH850-F1KX-EA-100PIN	Y-RH850-F1KX-EA-144PIN[1)]	Y-RH850-F1KX-EA-176PIN[2)]	Y-RH850-F1KX-EA-233PIN	Y-RH850-F1KX-EA-272PIN
YQ Connector	QB-100GC-YQ-01T	QB-144GJ-YQ-01T	QB-176GM-YQ-01T	-	
Target Connector	QB-100GC-NQ-01T	QB-144GJ-NQ-01T	QB-176GM-NQ-01T	Y-BSSOCKET 233A1715RE21N	
Space Adapter	QB-100GC-YS-01T	QB-144GJ-YS-01T	QB-176GM-YS-01T	-	
Mount Adapter	QB-100GC-HQ-01T	QB-144GJ-HQ-01T	QB-176GM-HQ-01T	Y-LSPACK233A1715RE01	

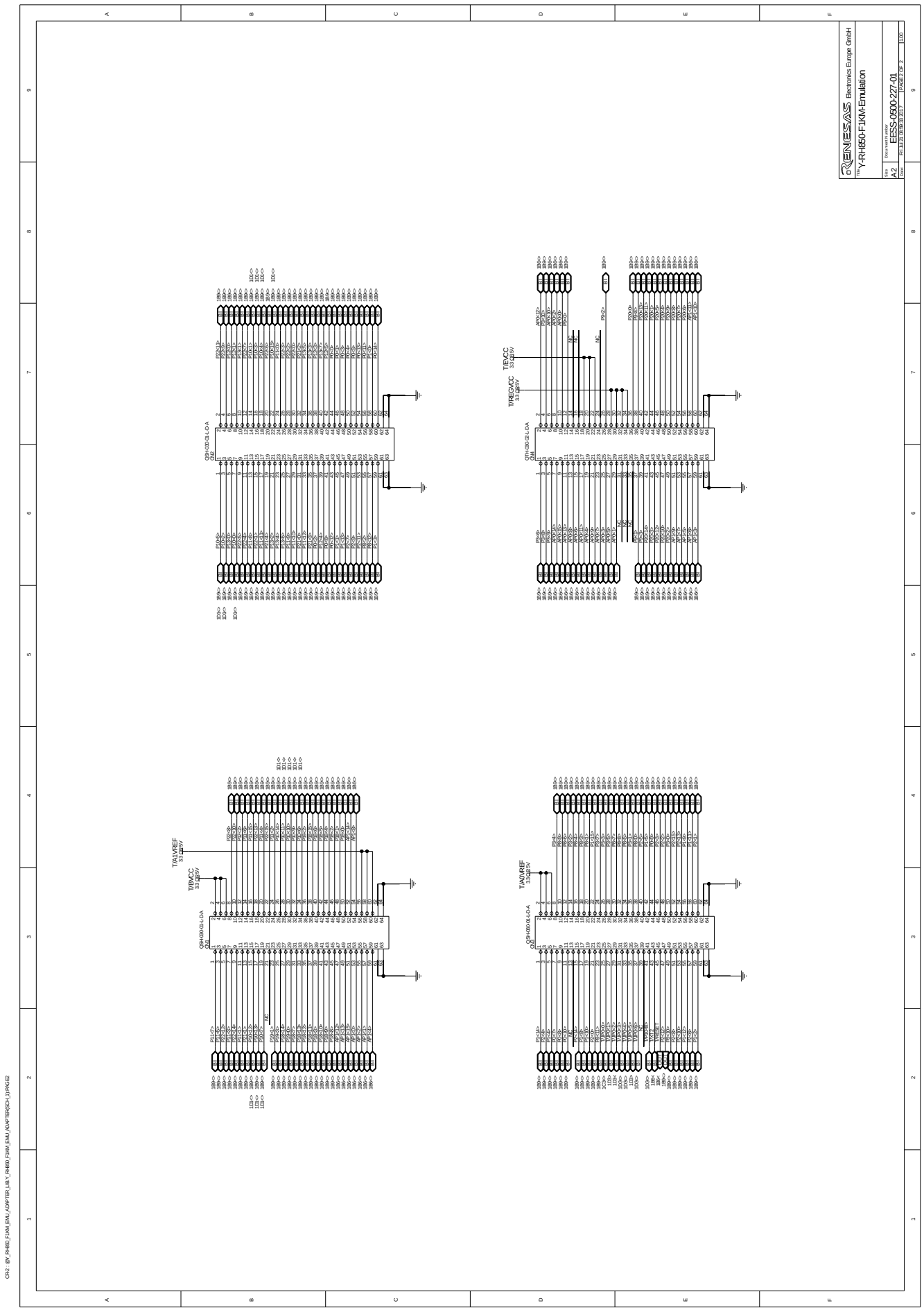
1) The Exchange Adapter for the 144 pin devices comprises of two boards:
   - L1 (layer 1) board: Y-RH850-F1KX-EA-1XXPIN-L1
   - L2 (layer 2) board: Y-RH850-F1KX-EA-144PIN-L2
2) The Exchange Adapter for the 176 pin devices comprises of two boards:
   - L1 (layer 1) board: Y-RH850-F1KX-EA-1XXPIN-L1
   - L2 (layer 2) board: Y-RH850-F1KX-EA-176PIN-L2

The schematics of the available Exchange-Adapters can be found in the chapters 4.3.

Chapter 4 Schematics

4.1 Emulation-Adapter

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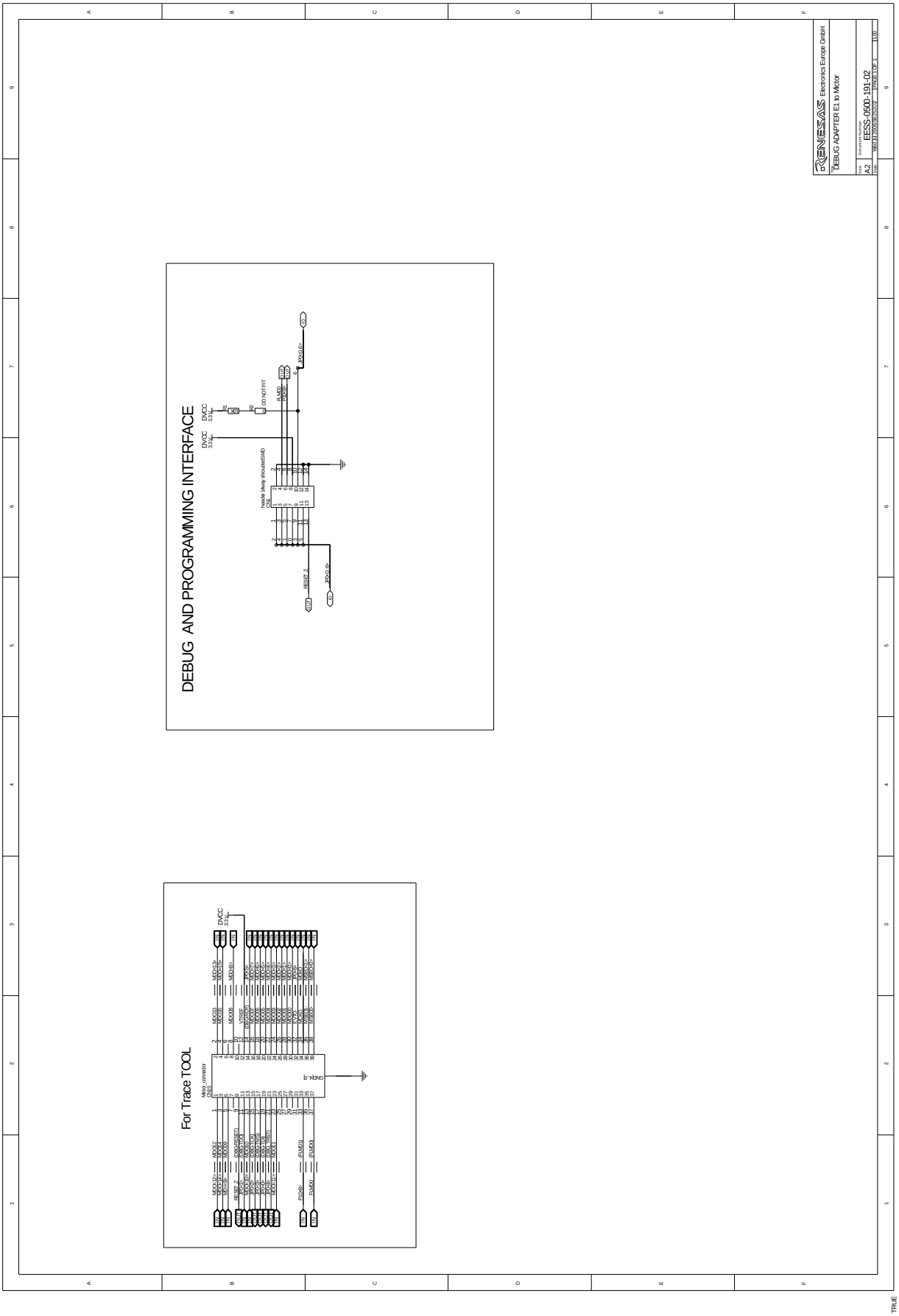
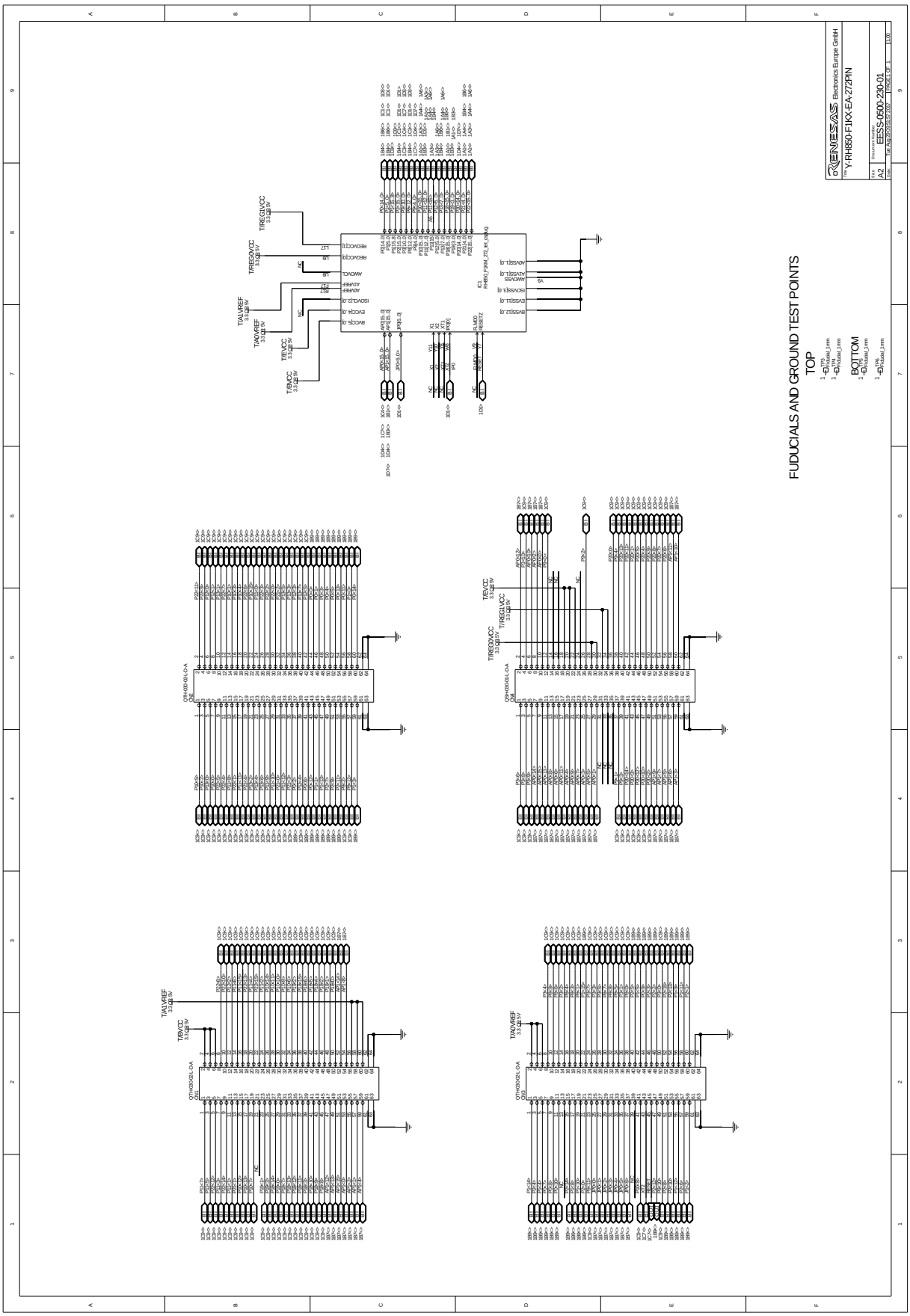
A2

4.2 Schematic Debug Exchange Board

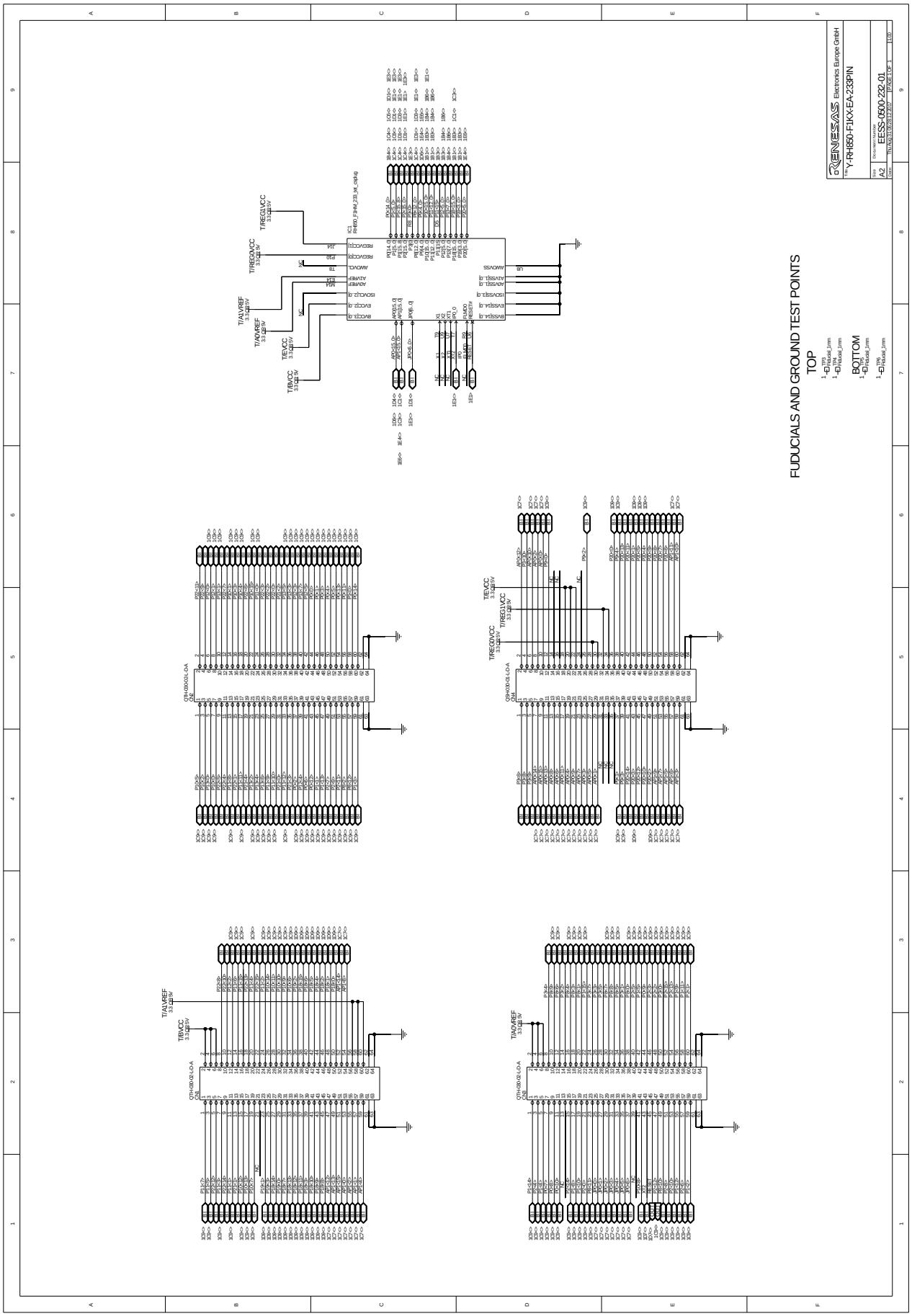


4.3 Exchange-Adapters

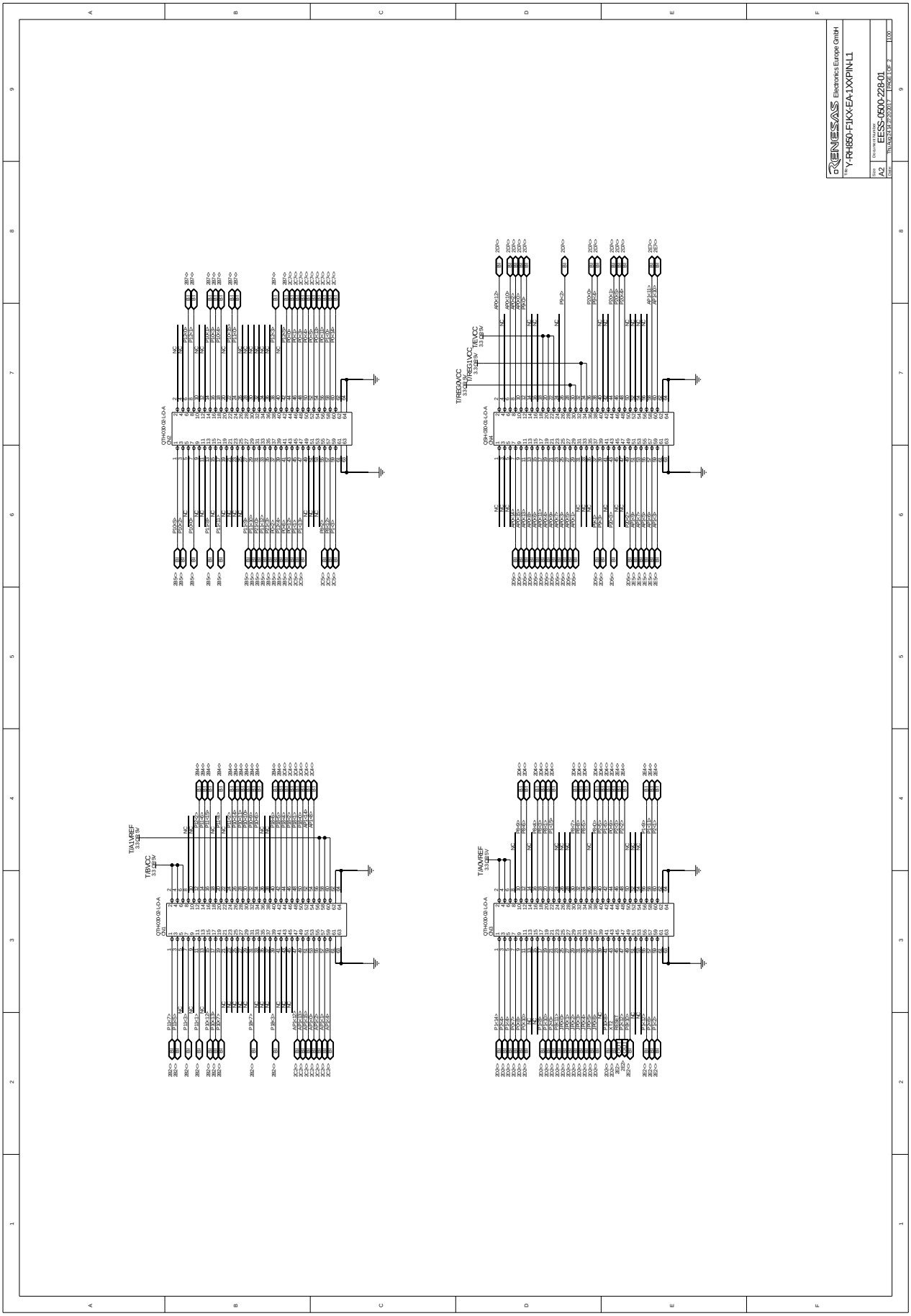
4.3.1 272pin Exchange-Adapter

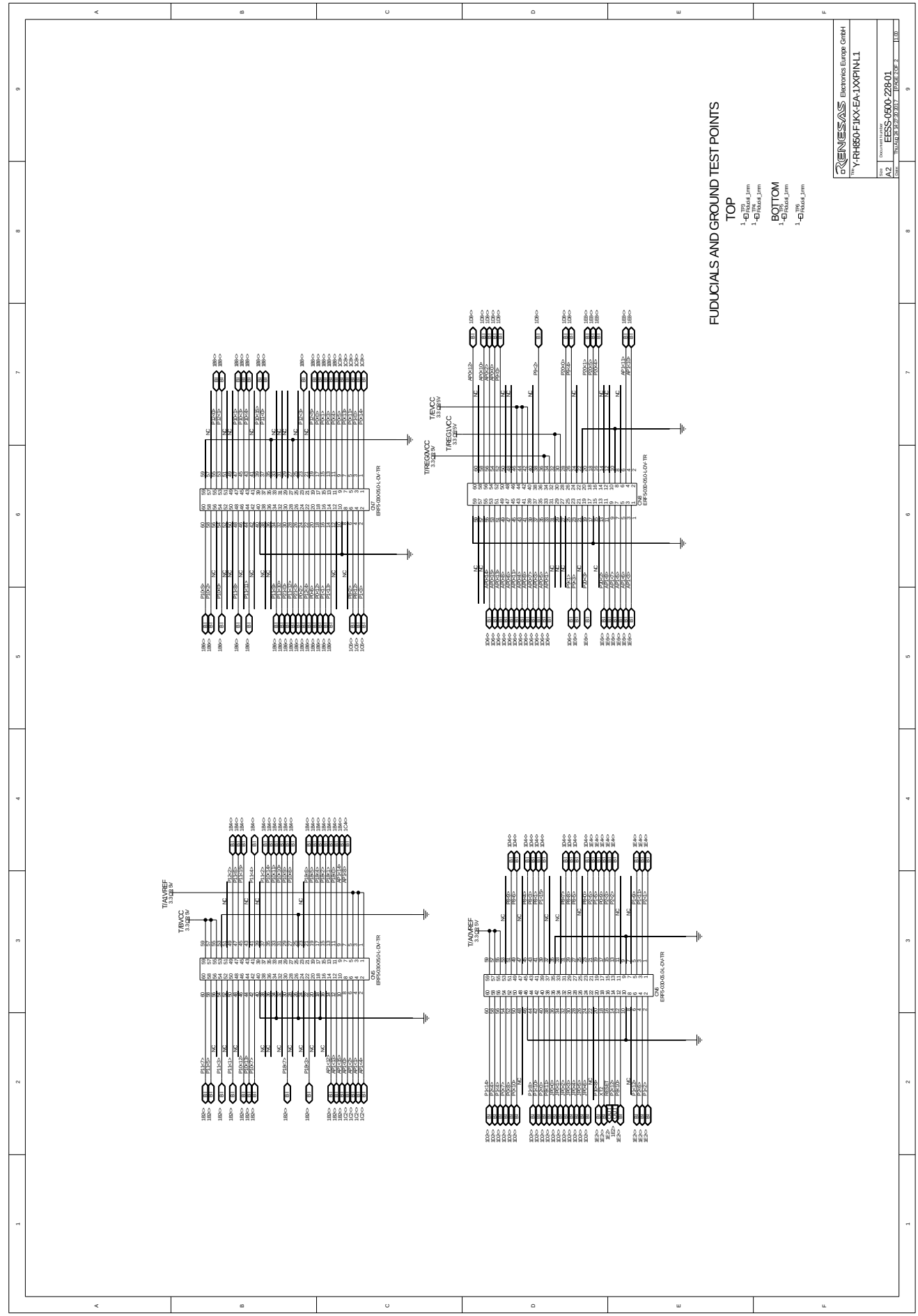


4.3.2 233pin Exchange-Adapter



4.3.3 176pin and 144 Layer 1 Exchange-Adapter




FUDUCIALS AND GROUND TEST POINTS
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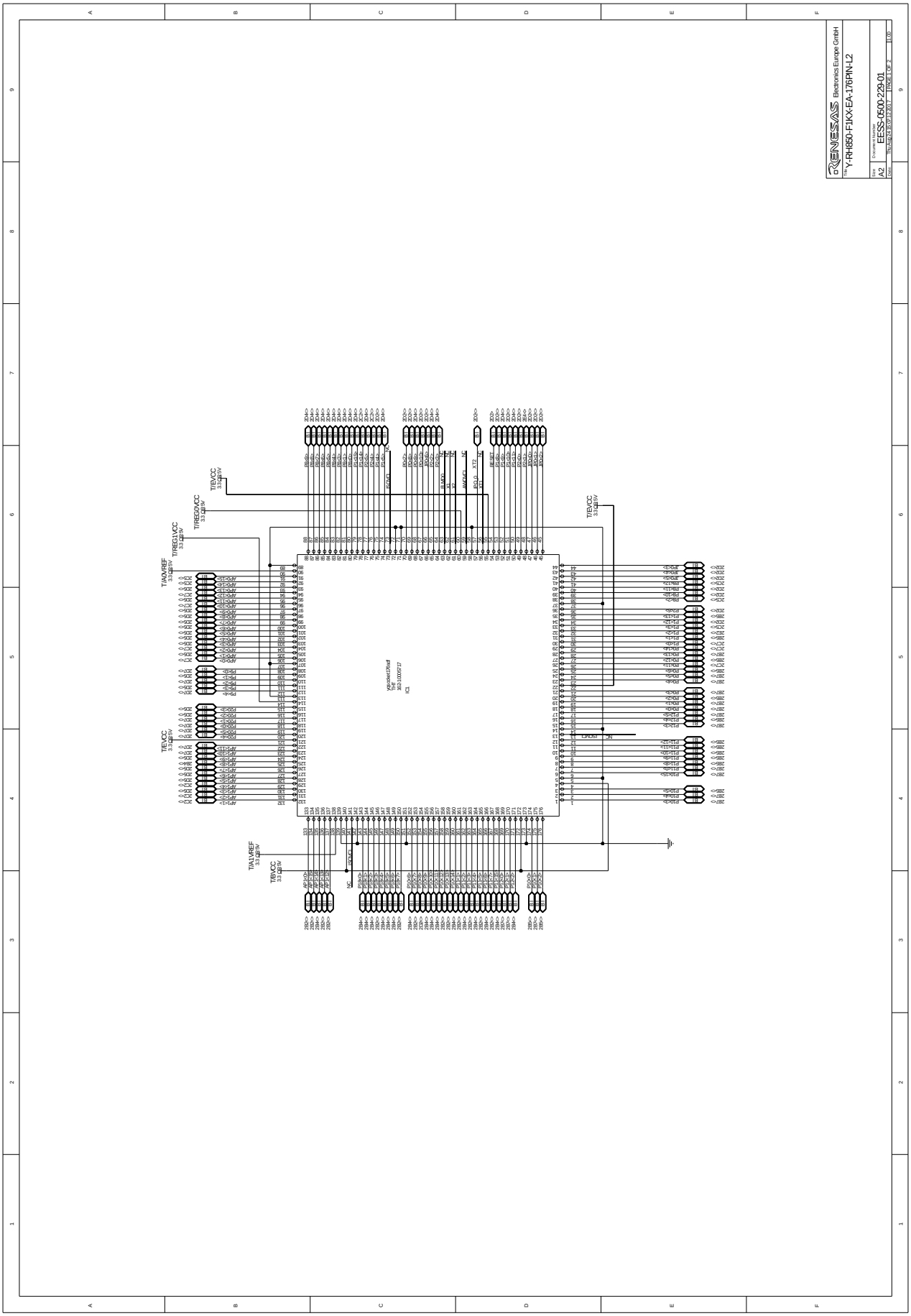
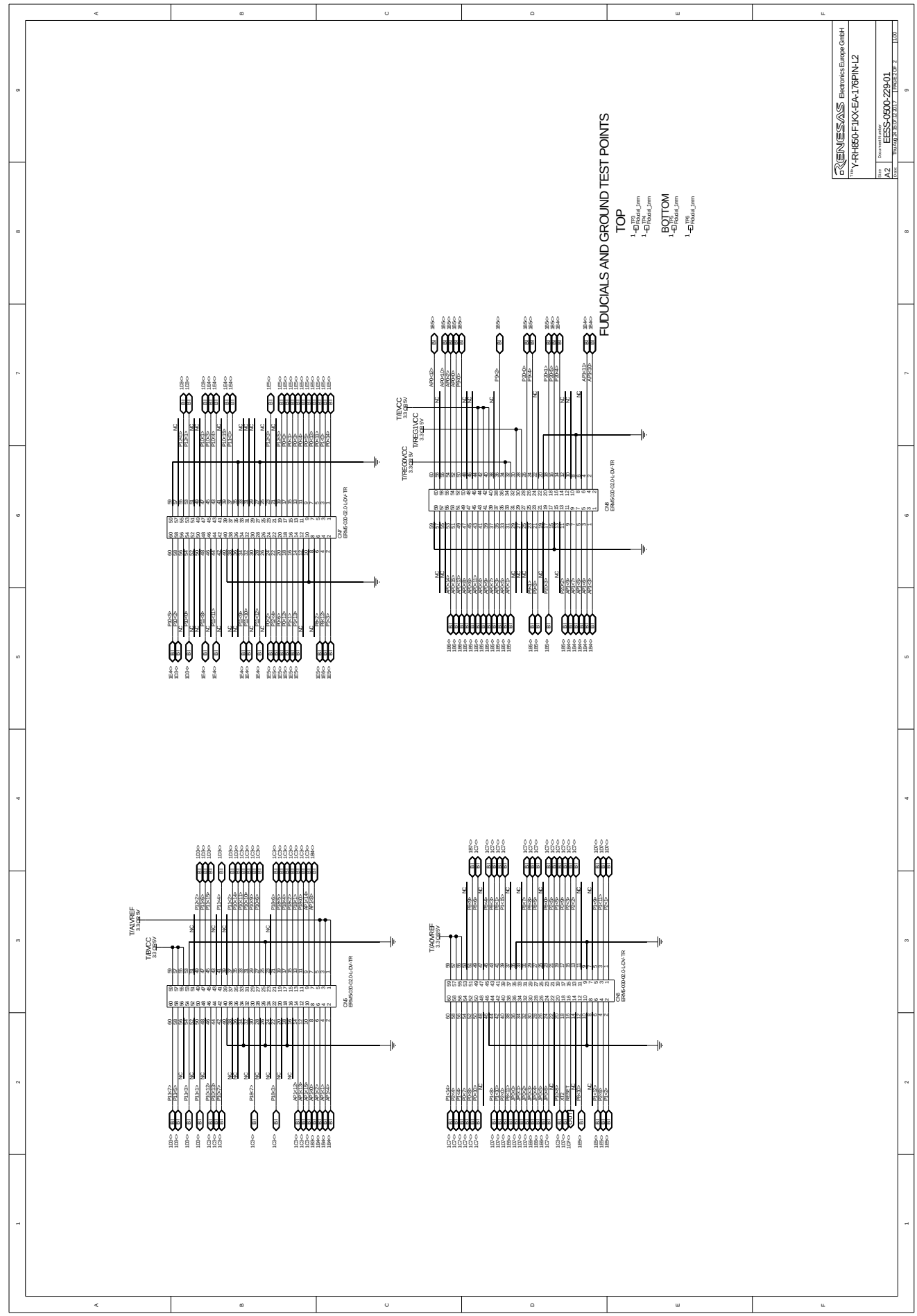
4.3.4 176pin Layer 2 Exchange-Adapter




FUDUCIALS AND GROUND TEST POINTS
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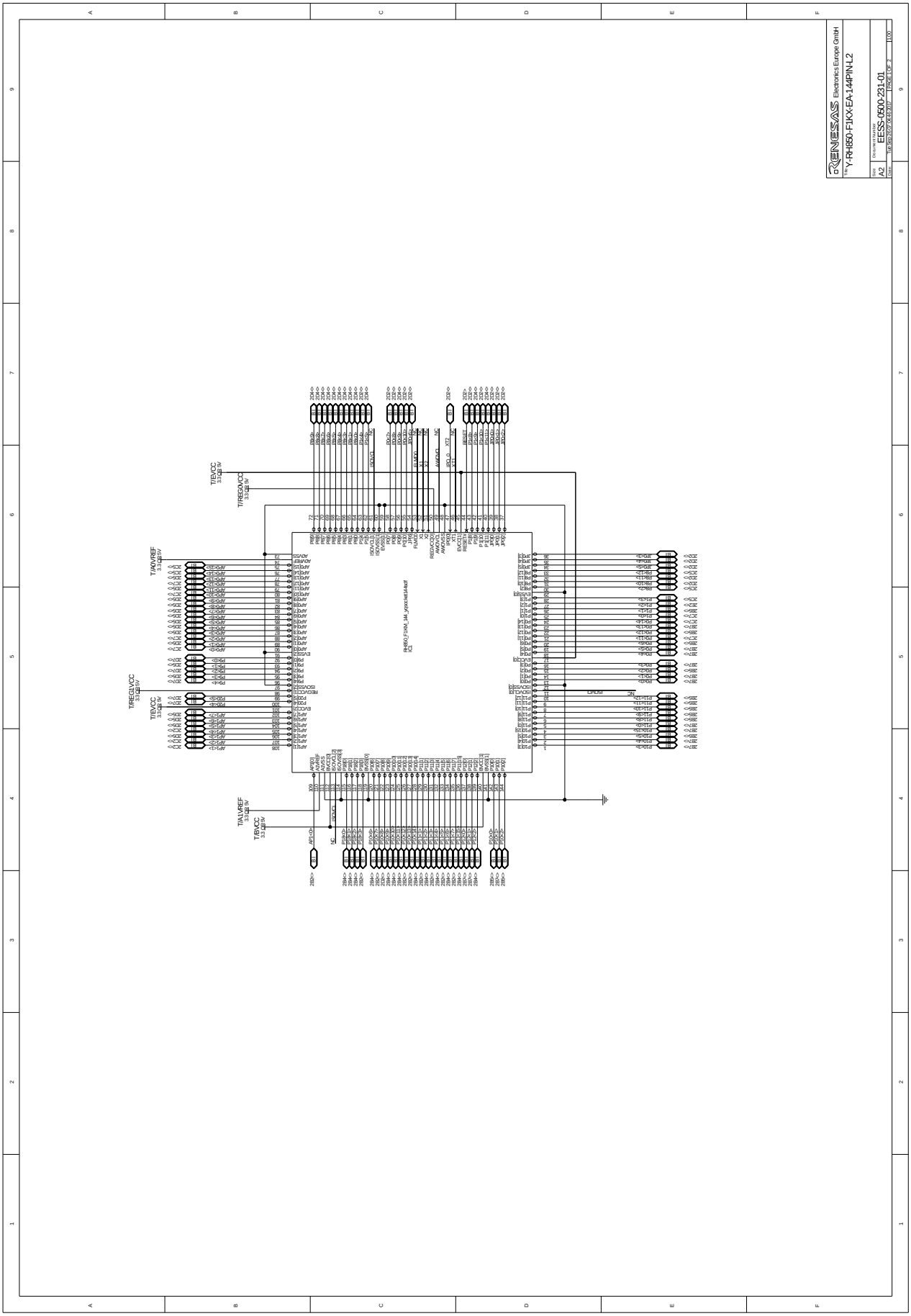
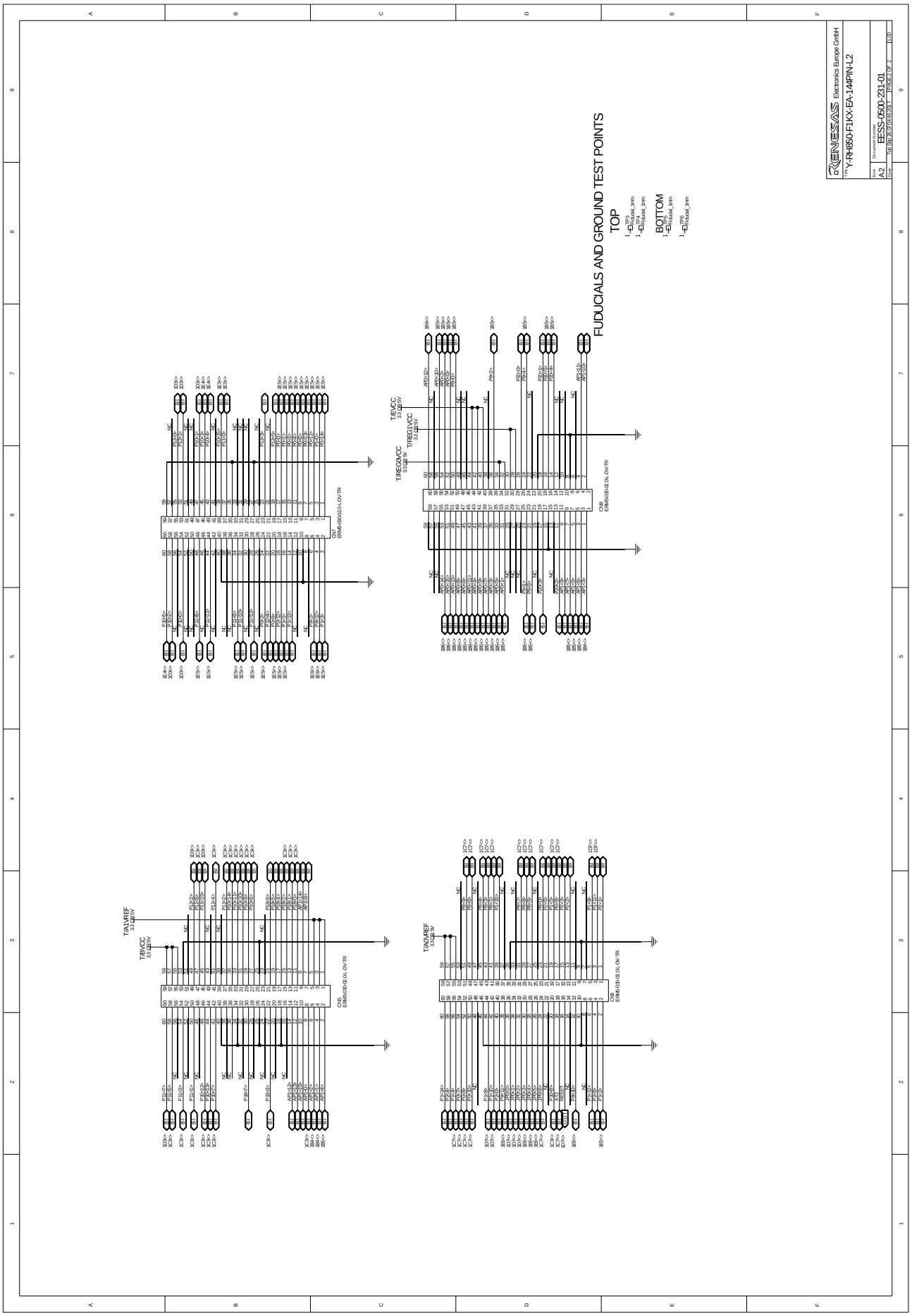
4.3.5 144pin Layer 2 Exchange-Adapter

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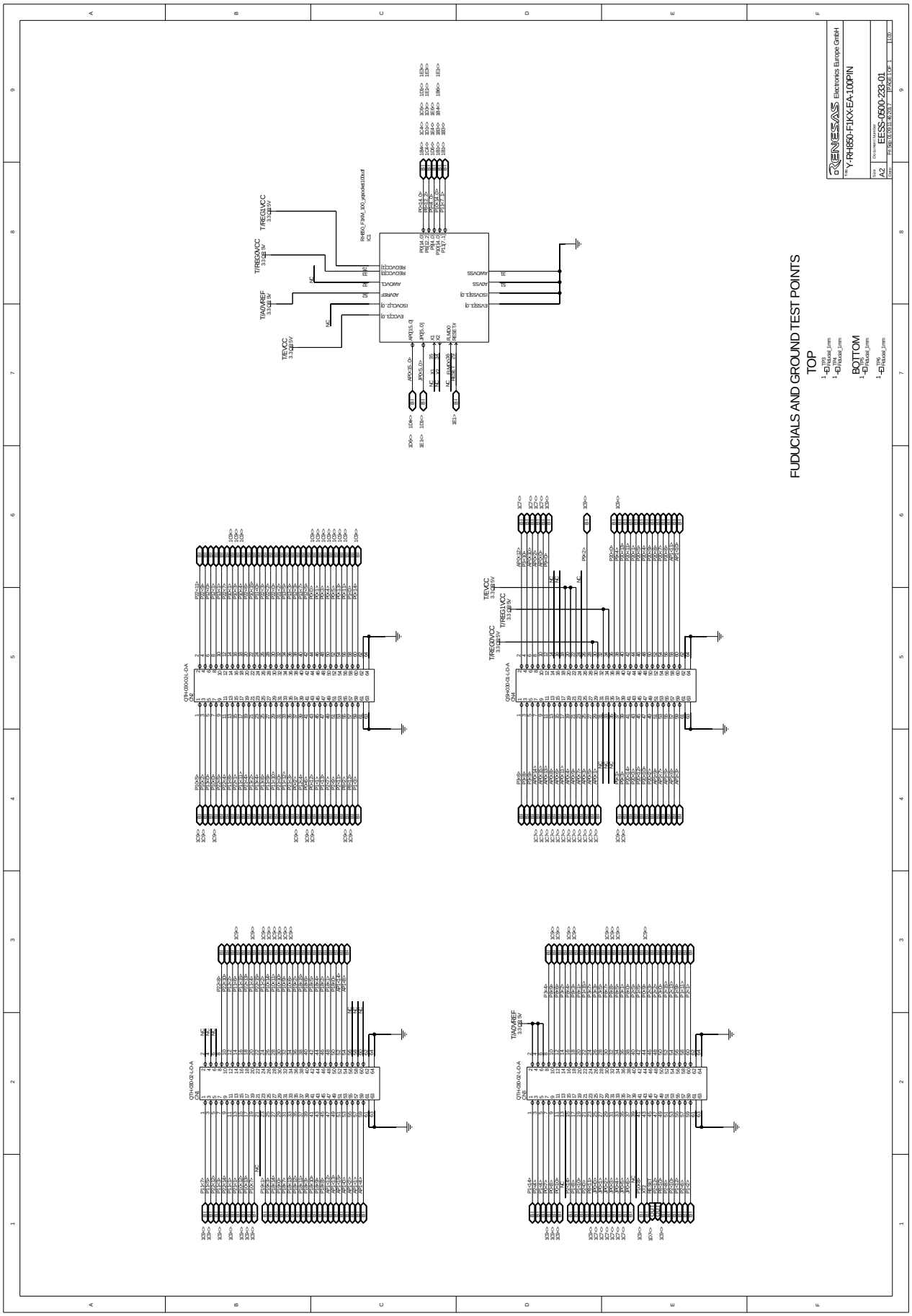
4.3.6 100pin Exchange-Adapter



Chapter 5 Revision History

The table provides information about the major changes of the document versions.

Date	Version	Description
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2801 Scott Boulevard Santa Clara, CA 95050-2549, U.S.A.
Tel: +1-408-588-6000, Fax: +1-408-588-6130

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

Renesas Electronics Europe Limited
Dukes Meadow, Millboard Road, Bourne End, Buckinghamshire, SL8 5FH, U.K
Tel: +44-1628-585-100, Fax: +44-1628-585-900

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 1709, Quantum Plaza, No.27 ZhiChunLu Haidian District, Beijing 100191, P.R.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, P. R. China 200333
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 1207, Block B, Menara Amcorp, Amcorp Trade Centre, No. 18, Jln Persiaran Barat, 46050 Petaling Jaya, Selangor Darul Ehsan, Malaysia
Tel: +60-3-7955-9390, Fax: +60-3-7955-9510

Renesas Electronics India Pvt. Ltd.
No.777C, 100 Feet Road, HAL II Stage, Indiranagar, Bangalore, India
Tel: +91-80-67208700, Fax: +91-80-67208777

Renesas Electronics Korea Co., Ltd.
12F., 234 Teheran-ro, Gangnam-Gu, Seoul, 135-080, Korea
Tel: +82-2-558-3737, Fax: +82-2-558-5141

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