RH850 Evaluation Platform

RH850/P1x-C Emulation Adapter

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Table of Contents

Chapter 1 Introduction

The RH850/P1x-C-BGA Adapter Set is available as RH850/P1x-C-BGA156 and as RH850/P1x-C-BGA292.
They can be used as development vehicle to emulate the RH850/P1x-C in a BGA156 or BGA292 package with a RH850/P1H-CE-BGA404 emulation device.

Each of the RH850/P1x-C-BGA Adapter Set exists of three parts.

Main features:

- Direct supply of device voltage (typ. 3.3V and 1.25V)

- Device programming capability

- Device debugging capability

- 16MHz MainOSC circuitry

This document guides the user using the RH850/P1x-C-156BGA Adapter Set and RH850/P1x-C-292BGA Adapter Set.

For details regarding the operation of the microcontroller itself, refer to the RH850/P1x-C User's Manual.
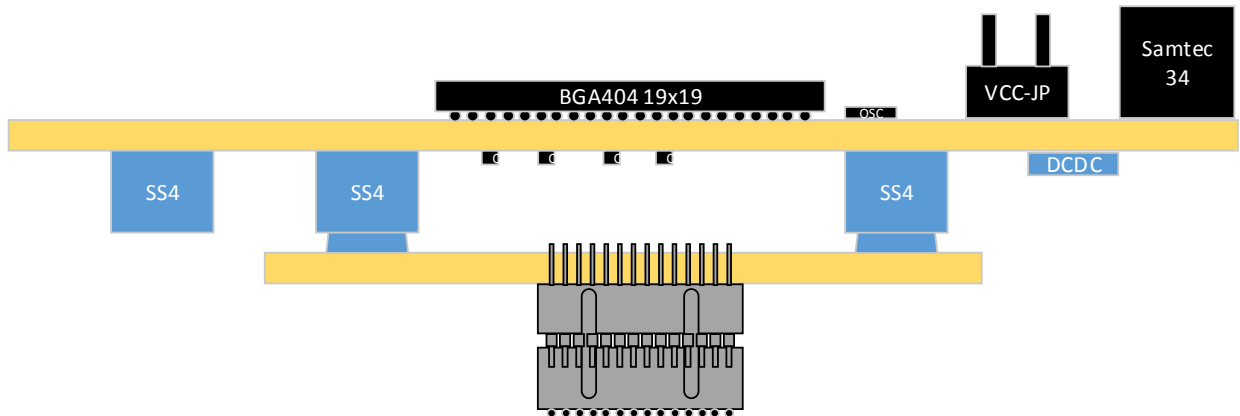

1.1   Emulated Devices

- The Adapter set is designed to emulate following devices:
    - ○ RH850/P1M-C BGA156
    - ○ RH850/P1H-C BGA156
    - ○ RH850/P1M-C BGA292
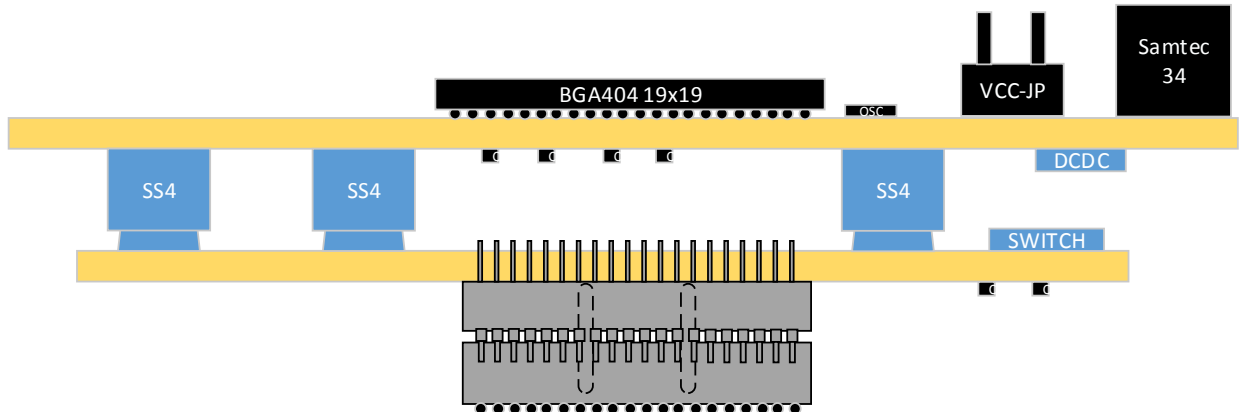   - ○ RH850/P1H-C BGA292

Chapter 2 Overview

The RH850/P1x-C-BGA Adapter Set is available as RH850/P1x-C-BGA156 and as RH850/P1x-C-BGA292

2.1.1   The RH850/P1x-C-156BGA Adapter Set

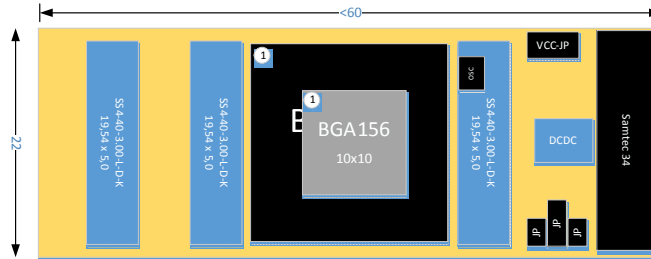### 2.1.2   The RH850/P1x-C-292BGA Adapter Set

2.2   Parts of the RH850/P1x-C-156BGA Adapter Set

RH850/P1x-C-156BGA Adapter Set consists of three parts:

- Y-RH850-P1XC-EMU-ADAPTER

  - RH850_Debug_Adapter is added to each Emulation Adapter

- Y-RH850-P1XC-EA-156PIN
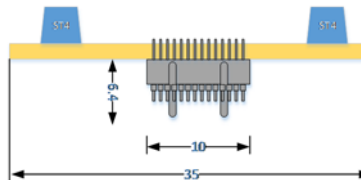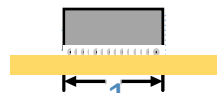

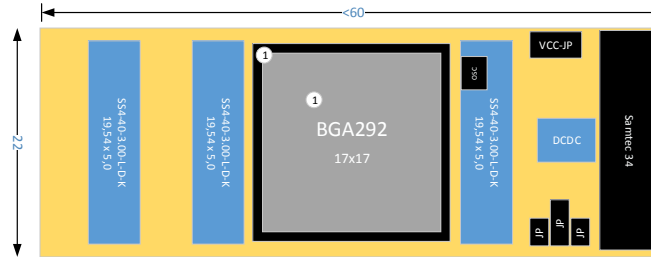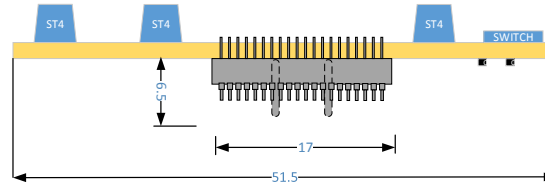- Y- BSSOCKET156B1410RE21N-FC

2.3 Parts of the RH850/P1x-C-292BGA Adapter Set

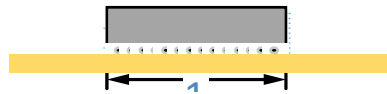RH850/P1x-C-292BGA Adapter Set consists of three parts:

- Y-RH850-P1XC-EMU-ADAPTER

    - RH850_Debug_Adapter is added to each Emulation Adapter

- Y-RH850-P1XC-EA-292PIN

- Y-BSSOCKET292A2017RE21N

2.4 Emulation Adapter

2.4.1 Y-RH850-P1XC-EMU-ADAPTER

Figure 1 provides a schematic view of the Emulation Adapter.
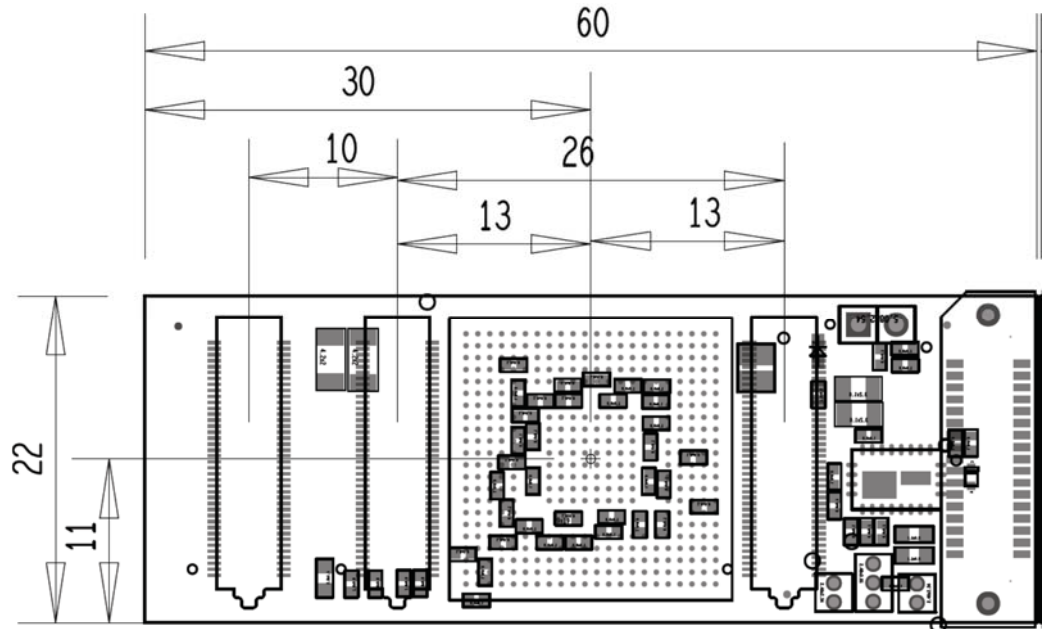
Figure 1 Emulation Adapter Schematic View

Main parts of the Emulation Adapter are:

- RH850/P1H-CE-BGA404 emulation device (top side).

- 16 MHz crystal (top side)

- DCDC converter (bottom side) to provide the VDD core voltage of 1.25V

- Jumper and power connector (top side)

- Samtec 34 pin connector (top side) to connect debugging tools

- Three Samtec SS4 80 pin connector (bottom side) to connect via Adapter a target application board.

Details of the mounting are available in the attachment document "rh850_p1xc_emu_adapter_Mounting_V1.pdf"

rh850_p1xc_emu_adapter_Mounting_V1

2.4.2   RH850_Debug_Adapter

An RH850_Debug_Adapter is added to connect tools with standard 14-pin connector to the Emulation Adapter with 34pin connector.
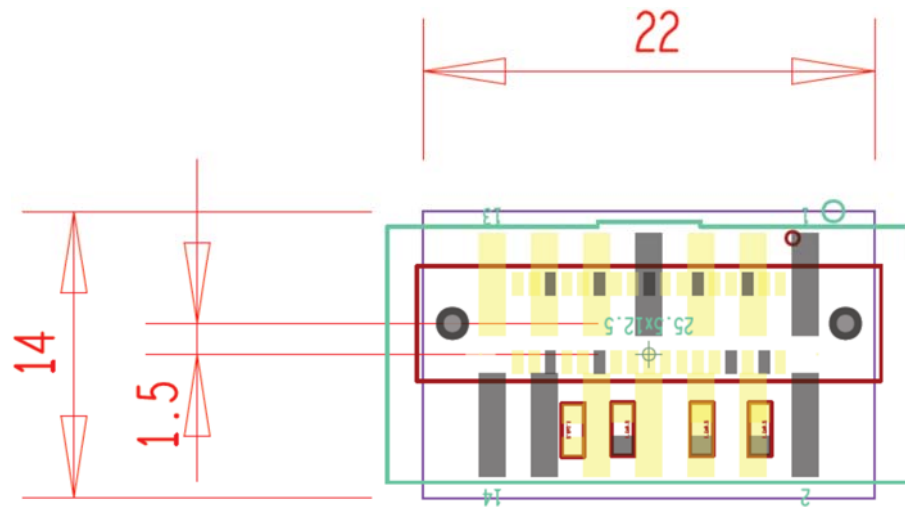

Figure 2 RH850_Debug_Adapter Schematic View

Main parts of the Emulation Adapter are:

- Samtec 34 pin connector (bottom side)
- Connector 14 pin (top side)
- 10k Ohm Pull-Down resistor for TRST, FLMD0 and FLMD1 signals
- 10k Ohm Pull-Up resistor for EVTO signal,

2.5 BGA Adapter

2.5.1 Y-RH850-P1XC-EA-156PIN

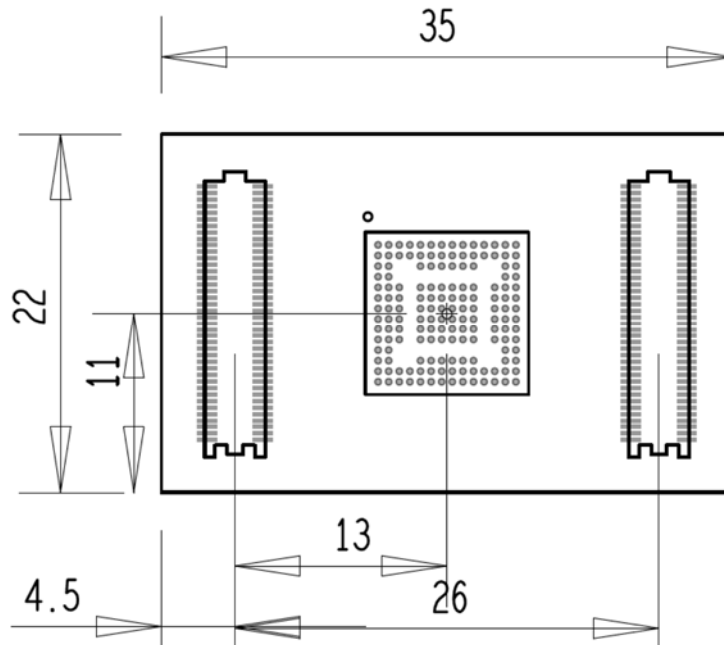Figures 3 provides a schematic view of the Exchange Adapter EA-156 pin.

Figure 3 EA-156pin Schematic Top View

Main parts of the EA-156pin are:

- Two Samtec ST4 80 pin connector (top side) to connect to the Emulation Adapter.
- CSPLUG_W156A to connect to the target board socket BSSOCKET156A

Details of the mounting are available in the attachment document "rh850_p1xc_ea_156pin_adapter_Mounting_V1.pdf"

rh850_p1xc_ea_156
pin_adapter_Mount

2.5.2 Y-RH850-P1XC-EA-292PIN

Figures 4 provides a schematic view of the Exchange Adapter EA-292 pin.
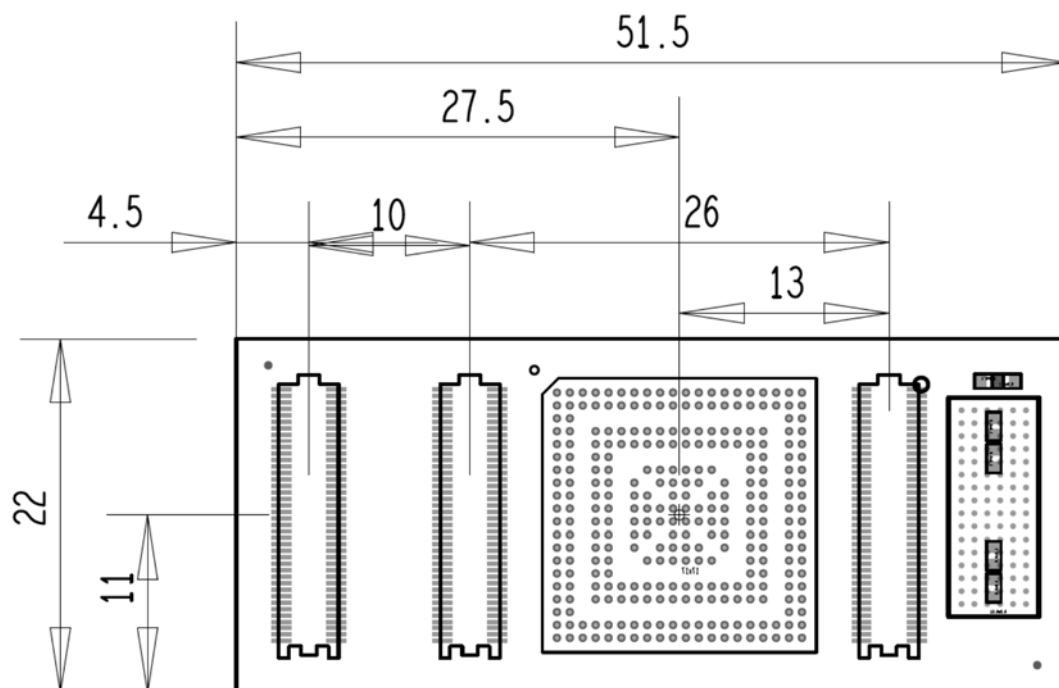

Figure 4 EA-292pin Schematic Top View

Main parts of the EA-292pin are:

- Three Samtec ST4 80 pin connector (top side) to connect to the Emulation Adapter.

- CSPLUG_W292A to connect to the target board socket BSSOCKET292A

- Jumper and 32-Bit Bus Switch SN74CB3Q32245ZKER to decouple different pin function between RH850/P1M-C and RH850/P1H-C.

Details of the mounting are available in the attachment document "rh850_p1xc_ea_292pin_adapter_Mounting_V1.pdf"

rh850_p1xc_ea_292
pin_adapter_Mount

The Y-RH850-P1XC-EA-292PIN has a jumper S1 to cover the different number of port pins between RH850/P1M-C and RH850/P1H-C.

- S1   Decouples ports P6.7 to P6.9, P6.14 and P6.15, P9.0 to P9.6, P8.0 to P8.15 and P7.6 to P7.9 between target board and Emulation Adapter.

  - **Pin 1-2: Open**

    - For using RH850/P1M-C.
      Not available ports are disconnected to avoid conflict to EnVSS connection of RH850/P1M-C

  - Pin 1-2: Connected

    - Ports connected between target board and Emulation Adapter for RH850/P1H-C

2.6 BSSOCKET

2.6.1 Y-BSSOCKET156B1410RE21N-FC

The BSSOCKET156 is a socket that is soldered on the target application board with the RH850/P1x-C-156BGA footprint. It allows connecting the Emulation Adapter via the Exchange Adapter EA-156 pin to the target board.

Details of the BSSOCKET156 are available in the attachment document "BSSOCKET156B1410RE21N-FC"

BSSOCKET156B1410
RE21N-FC.PDF

2.6.2 Y-BSSOCKET292A2017RE22N-FC

The BSSOCKET292 is a socket that is soldered on the target application board with the RH850/P1x-C-292BGA footprint. It allows connecting the Emulation Adapter via the Exchange Adapter EA-292 pin to the target board.

Details of the BSSOCKET292 are available in the attachment document "BSSOCKET292A2017RE21N-FC"

BSSOCKET292A2017
RE22N.PDF

Chapter 3   Functional description

3.1   Operating conditions

Operation temperature of the board is -20°C <= Ta <= +85°C.

For details regarding the operation of the microcontroller itself, refer to the RH850/P1X-C User's Manual.

3.2   MainOsc

The Emulation Adapter is preconfigured with a 16 MHz SMD crystal. The oscillator pins X1 and X2 are not connected to the target board.

3.3   Power Supply

A real device RH850/P1H-CE-404BGA is used on the Emulation Adapter. Therefore the Emulation Adapter has the same voltage specification as the device.

For details for the power supply voltages of the device refer to the RH850/P1x-C User's Manual.
For differences in the specification between RH850/P1H-CE-404BGA and the target devices RH850/P1x-C in BGA156 or BGA292 package, refer to the RH850/P1x-C User's Manual.

The VDD current consumption of the RH850/P1H-CE-BGA404 device is much higher compared to the target device RH850/P1x-C. Therefore the VDD core supply of typical 1.25V is always supplied locally on the Emulation Adapter by the DCDC regulator IC3. This local VDD voltage is not connected to the target application board. *Note 1*
For operation of the Emulation Adapter a supply voltage VCC must be connected to the CN5 connector. Typical supply voltage for CN5 is VCC=3.3V.

- CN5   VCC Emulation Adapter power supply connector

    - CN5 connector supplies via DCDC regulator the VDD supply for the RH850/P1H-CE.
      CN5 can also be used to supply the VCC voltage. For VCC supply see jumper JP1 and JP3.

    - Pin 1: VCC (3.3V typ), Pin 2: GND

    - Voltage on CN5 is signaled by the green LED1

The VCC used for the Emulation Adapter is divided in two parts.

- VCC3 is supplying all 3.3V logic parts like VCC, SYSVCC, DVCC, EmulationVCC and ERAMVCC.

- VCCIO is the central supply point for the I/O supply like EnVCC, AnVCC and AnVREF. *Note 2, Note3*

The VCC3 supply is selectable. Depending on the current drivability of the target application board different selection can be used.

- JP1   VCC3 power supply selector
  - JP1 (pin 2) supplies VCC3 on the Emulation Adapter. Beside it can supply VCCIO in combination with jumper JP3.
  - **Pin 1-2: Open, Pin 2-3: Connected (Preferred)**
    - Source of VCC3 is the target application board. Therefore VCC3 is connected to the VCC3TD pins of the target board
  - Pin 1-2: Connected, Pin 2-3: Open
    - Source of VCC3 is CN5 connector
- JP3   VCCIO power supply source
  - JP3 connects VCC3 voltage to VCCIO.
  - **Pin 1-2: Open (Preferred)**
    - EnVCC, AnVCC and AnVREF are supplied from the target application board only.
  - Pin 1-2: Connected
    - JP3 connects VCC3 voltage to VCCIO.
      CAUTION:
      A conflict to VCC3 could occur in case EnVCC, AnVCC and AnVREF are supplied on target board. To damp danger of damage for the Emulation adapter, there are 10-Ohm protection resistors between VCCIO and the EnVCC, AnVCC and AnVREF supply.
- JP2   RESET selector
  - **Pin 1-2: Connected**
    - Local RESET connected to RESET_TD pin of target application board
  - Pin 1-2: Open
    - JP2 open keeps the RESET local to the Emulation Adapter. RESET is disconnected from target application board

Notes:

1. To keep the voltage supply order at power-up the VDD is enabled depending on the VCC supplies:
   a. VDD is enabled when the majority of EnVCC, AnVCC, AnVREF is supplied from target application board.
   b. VDD is enabled when VCC3 is selected by JP03.
   c. [Update] VDD is enabled when SYSVCCTD from target application board is supplied and R7 is updated to 100kOhm

2. Different to the behavior of RH850/P1x-C the Emulation Adapter connects EnVCC, AnVCC and AnVREF supply pins with protection resistors. In case this conflicts with the target application the resistors R9 to R15 can be removed.

3. The VCCIO voltage is available to all EnVCC, AnVCC and AnVREF supply pins. Due to the serial protection resistor of 10 Ohm the port input level or output voltage depends on the related I/O supply current.

3.4　Debug and Programming interface

3.4.1　34pin Trace and Aurora IF Connector

- The Emulation Adapter has a 34pin connector for the Aurora I/F
- The following is the pin assignment

Pin # on Samtec	Device Port	Pin # on Samtec	Device Port
1	TODP0	2	E1VCC
3	TODN0	4	TCK
5	GND	6	TMS
7	TODP1	8	TDI
9	TODN1	10	TDO
11	GND	12	TRST
13	NC	14	FLMD0
15	NC	16	EVTI
17	GND	18	EVTO
19	NC	20	FLMD1
21	NC	22	RESETZ
23	GND	24	GND
25	NC	26	CICREFP
27	NC	28	CICREFN
29	GND	30	GND
31	NC	32	DRDY
33	NC	34	NC

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3.4.2 Debug and Programming interface of the 14 pin connector

To ease connection of tools with 'standard' connector interface a RH850_Debug_Adapter is added to each Emulation Adapter. The signal connection of the 14 pin connector is shown in the table below:

Pin	Device Port	Device Signal
1	JP0_2	TCK / LPDCLK / FLSCI3SCKI
2	GND	GND
3	JP0_4	TRSTZ
4	FLMD0	FLMD0
5	JP0_1	TDO / LPDO / FLSCI3TXD
6	-	-
7	JP0_0	TDI / LPDI / FLSCI3RXD / FLSCI3TXD
8	E1VCC	I/O voltage of debug pins
9	JP0_3	TMS
10	EVTOZ	Other Debug (RH850/P1H-CE only)
11	JP0_5	RDYZ / LPDCLKOUT
12	GND	-
13	RESET	RESETZ
14	GND	-

Chapter 4 Precautions

Enabling of the local VDD voltage on the Emulation Adapter is independent of the supply of the SYSVCCTD voltage on target board.

To enable this additional monitor feature the resistor R7 must be replaced by a 10k Ohm resistor.

Except to miss this feature there is no restriction using R7 as is with 100k Ohm.

Limitations other as above are not known at the release of this document.

Chapter 5 Schematic

CAUTION: *The schematic attached to this document is not intended to be used as a reference for mass production. Any usage in an application design is in sole responsibility of the customer.*

Emulation Adapter

"rh850_p1xc_emu_adapter_schematic_20161123.pdf"

rh850_p1xc_emu_ad
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"rh850_debug_adapter_schematic_20160909.pdf"

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ter_schematic_2016C

EA Adapter 156 pin

"rh850_p1xc_ea_156pin_adapter_schematic_20160909.pdf"

rh850_p1xc_ea_156
pin_adapter_schema

EA Adapter 292 pin

"h850_p1xc_ea_292pin_adapter_board_schematic_20170622.pdf"

h850_p1xc_ea_292p
in_adapter_board_s

Chapter 6 Revision History

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

Date	Version	Description
2017-01-05	1.0	Initial release
2017-09-04	2.0	Add "RH850/P1x-C-292BGA Adapter Set" And change Doc name "RH850/P1x-C-156BGA Adapter Set" to "RH850/P1x-C-Emulation Adapter"

Notice

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