AGENDA

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RH850 Tools Eco System Overview

IDEs/Compiler
- TASKING
- IAR Systems
- Wind River
- Green Hills Software

Emulator
- Synopsys
- ETAS
- dSPACE

Evaluation Boards
- MathWorks
- Timing Architects
- AbsInt

Getting Started
Software Manual
User's Manual

Emulation Manual
Application Notes
Samples
Processor model

Auto Code Generation

Measurement & calibration
Simulation/Virtual Prototyping

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Auto Code Generation
RH850/P1x-C – Software Development Tools
Green Hills Multi® C/C++ Compiler

- Integrated development environment with project management tools and editor
- Highly optimizing C/C++ compiler for V850ES/E1/E2, RH850G3K(H)/G3M(H) and G4MH cores
- Debugging system support
  - Integrated MultiCore Debug Concept
  - Green Hills Software Simulator
  - Renesas E1, E2 and IE850A Emulator integration
  - TimeMachine Debugging Suite (Optional Add-On)
- MISRA C checker
- Eclipse build phase plug-in support
- Supports ELF/DWARF debug format (Renesas ABI)
- Different license options available: Node-Locked, Dongle and Network
- Current Version: Multi IDE 7.1.6*, Compiler 2019.1.5*
- Order Codes:
  - Y-GHS-MULTI-V800-FULL (SW-license)
  - YGHS-DONGLE-USB (USB dongle)
  - Y-GHS-MULTI-V800-ISO-CERT-xx-x (ISO26262 certificate)

*: April 2020
IAR Embedded Workbench for RH850

- Integrated development environment with project management tools and editor
- Highly optimizing C/C++ compiler for RH850G3K(H)/G3M(H) and G4MH cores
- Debugging system support
  - C-SPY Debugger simulator
  - Renesas E1/E2 OCD Emulator integration
  - RTOS-aware debugging with built-in plug-in for OSEK Run Time Interface
- MISRA C checker
- Eclipse build phase plug-in support
- Supports ELF/DWARF debug format (Renesas ABI)
- Different license options available: Node-Locked, Dongle und Network
- Current Version: V2.10.2*
- Order Codes:
  - Y-IAR-EWRH850-FULL (standalone SW-license)
  - Y-IAR-EWRH850-FULL-MOBILE (standalone Dongle-license, USB dongle included)

*: April 2020
E2 - On-Chip Debugging Emulator

- On-Chip Debugger for all RH850 devices
- On-Board flash programming tool option
  - Supported by Renesas Flash Programming Software GUI (RFP)
- Improvement from E1
  - Download speed (2 times faster than E1)
- New features
  - Supports Software trace via LPD (Low Pin Debug) I/F (2M trace data frame)
  - Supports Break/Trace-Stop function by External trigger input function
  - Supports hot plug-in connector
- Target Connection Interfaces (depending on device)
  - 1-pin/4-pin LPD
- Package includes
  - USB interface cable, GND cable for hot plug-in, 14-pin target cable
- USB 2.0 HS interface
- Power supply: USB bus powered
- Supports power supply function to target
  - 3V…5V (max. 200mA)
- Order Code: RTE0T00020KCE00000R
3rd Party Emulator Support

- Support of 3rd party tool vendors for RH850 via dedicated tool department at Düsseldorf
- Complete information exchange including design information based on individual and mutual NDA between REE and 3rd party tool vendor
- Central support and coordination from Düsseldorf location
- Device samples and target hardware provided by Renesas
- Close relation between Renesas, 3rd party tool vendor and customer during design-in and product evolution phase
3rd Party Emulator Support  iSystem and Lauterbach

- Universal emulator and debugger system
- Universal debug hardware i.e. iC5700, iC5000, iC6000
- Supported targets: RL78 and RH850
- Support for common compiler platforms
- For more information visit www.isystem.com

- Universal debugger system TRACE32®
- Universal debug hardware i.e. PowerDebug USB3 or Pro
- Supported targets: RL78 and RH850
- Support for common compiler platforms
- For more information visit www.lauterbach.com
Evaluation Platform – RH850/P1x-C Solution Overview

- Modular design, available for all package variants

<table>
<thead>
<tr>
<th>Supported Devices</th>
<th>RH850/P1x-C Series</th>
</tr>
</thead>
<tbody>
<tr>
<td>Board Type</td>
<td>LQFP 80-pin</td>
</tr>
<tr>
<td>RH850/P1L-C</td>
<td>RH850/P1L-C</td>
</tr>
<tr>
<td>RH850/P1H-C</td>
<td>RH850/P1H-C</td>
</tr>
<tr>
<td>RH850/P1M-C</td>
<td>RH850/P1M-C</td>
</tr>
</tbody>
</table>

- Piggyback board (supports standalone operation):
  - Y-RH850-P1XC-080PIN-PB-T1-V1
  - Y-RH850-P1XC-100PIN-PB-T1-V1
  - Y-RH850-P1XC-144PIN-PB-T1-V1
  - Y-RH850-P1XC-156PIN-PB-T1-V1
  - Y-RH850-P1XC-292PIN-PB-T1-V2
  - Y-RH850-P1XC-404PIN-PB-T1-V2

- Main board (adds additional functionality, e.g. physical I/F for Ethernet, FlexRay, CAN and LIN):
  - Y-RH850-X1X-MB-T1-V1
  - Y-RH850-X1X-MB-T2-Vx
  - Y-RH850-X2X-MB-T1-V1
Burn-In Socket adapter for MCU target connection
- Either from YAMAICHI or Enplas

Stand-alone operation option
- direct supply for device (typ. 1.5V - 3.3V – 5.0V)

14-pin Debug and Flash programming connector for E1 and PG-FP5
- offering 1-pin/4-pin LPD and JTAG debug connection support
- offering serial flash programming support

AURORA Trace Connector (product dependent)

External clock circuits
- with an exchangeable 8/16 MHz Crystal Resonator

Reset button

All I/O pins are directly accessible
Evaluation Platform – Outline Spec Standard Main Board

- Adaptation headers to connect MCU Piggyback boards
- 12V power supply connection
  - 2 DC-DC Regulators (configurable for 1.25V, 3.3V, 5.0V)
  - DC Power Jack (ID=2.1mm, center positive)
  - 4mm Banana Jacks (1x red, 1x black)
- Communication interfaces
  - 2x CAN ports, 2x LIN ports, 1x FlexRay port (with two channels)
  - 1x RJ45 Ethernet port
  - 2x UART/RS232 port, 2x SENT interface, 2x PSI5 interface
- 4x Signal LEDs (Active High)
- 3x Push buttons
- 3x Analog Input Poti (2x via multiplexer circuit)
- LCD Module, Breadboard area
- Order Code: Y-RH850-X1X-MB-T1-V1
Evaluation Platform – Outline Spec Network Main Board

- Adaptation headers to connect MCU Piggyback boards
- 12V power supply connection
  - 2 DC-DC Regulators (configurable for 1.25V, 3.3V, 5.0V)
  - DC Power Jack (ID=2.1mm, center positive), 4mm Banana Jacks (1x red, 1x black)
- Communication interfaces
  - 8x CAN(-FD) ports, 16x LIN ports, 1x FlexRay port (with two channels)
  - 1x Ethernet port (selectable either for BroadR-Reach® or RJ45)
  - 2x UART/RS232 port
- 4x Signal LEDs (Active High)
- 3x Push buttons, 2x Analog Input Potentiometer
- TFT touch Display Interface (Arduino Standard)
- Breadboard area
- Order Codes:
  - Y-RH850-X1X-MB-T2-V1 (without display)
  - Y-RH850-X1X-MB-T2-V2 (including display)
Evaluation Platform – Outline Spec X2X Main Board

- Adaptation headers to connect MCU Piggyback boards
- 12V power supply connection
  - 2 DC-DC Regulators (configurable for 3.3V, 5.0V)
  - DC Power Jack (ID=2.1mm, center positive) as well as 4mm Banana Jacks (1x red, 1x black)
- Communication interfaces
  - 16x CAN(-FD) ports, 24x LIN ports, 1x FlexRay port (with two channels)
  - 2x Ethernet ports (with exchangeable PHY Ext. boards)
  - 2x UART/RS232 port
  - 2x SENT ports
- 20x Signal LEDs (Active High), 1x Rotary switch
- 2x Push buttons, 2x Analog Input Potentiometer
- TFT touch Display Interface (Arduino Standard)
- Order Code: Y-RH850-X2X-MB-T1-V1
### Evaluation Platform – X2X Main Board Extension Boards

<table>
<thead>
<tr>
<th>Part name</th>
<th>Description</th>
<th>Outline Picture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y-RH850-EMMC-SFMA-EXT-BRD</td>
<td>eMMC/SFMA Extension board</td>
<td></td>
</tr>
<tr>
<td>Y-RH850-SENT-EXT-BRD</td>
<td>SENT Extension board</td>
<td></td>
</tr>
<tr>
<td>Y-RH850-TFT-EXT-BRD</td>
<td>TFT display / 2.8&quot; TFT Touch Shield with Capacitive Touch</td>
<td></td>
</tr>
</tbody>
</table>
# Evaluation Platform – Mainboard Comparison

<table>
<thead>
<tr>
<th>Category</th>
<th>Y-RH850-X1X-MB-T1-V1</th>
<th>Y-RH850-X1X-MB-T2-Vx</th>
<th>Y-RH850-X2X-MB-T1-V1</th>
</tr>
</thead>
<tbody>
<tr>
<td>UART</td>
<td>2ch</td>
<td>2ch (shared with LIN0/1 interfaces)</td>
<td>2ch (1ch shared with LIN0)</td>
</tr>
<tr>
<td>LIN</td>
<td>2ch</td>
<td>16ch</td>
<td>24ch</td>
</tr>
<tr>
<td>CAN</td>
<td>2ch</td>
<td>8ch (CAN-FD)</td>
<td>16ch (CAN-FD)</td>
</tr>
<tr>
<td>FlexRay</td>
<td>2ch</td>
<td>2ch</td>
<td>2ch</td>
</tr>
<tr>
<td>Ethernet</td>
<td>1ch (RJ45)</td>
<td>1ch (selectable between RJ45 or BroadR-Reach®)</td>
<td>2ch (I/F connector for exchangeable PHY Extension boards, add-on product)</td>
</tr>
<tr>
<td>SENT</td>
<td>-</td>
<td>-</td>
<td>2ch (I/F connector to connect SENT Sensor boards, add-on product)</td>
</tr>
<tr>
<td>PSI5/PSI5S</td>
<td>-</td>
<td>-</td>
<td>2ch (supported by I/F connector)</td>
</tr>
<tr>
<td>eMMC/SFMA</td>
<td>-</td>
<td>-</td>
<td>supported (I/F connector for eMMC/SFMA Extension board, add-on product)</td>
</tr>
<tr>
<td>Signals LEDs</td>
<td>4</td>
<td>4</td>
<td>4 + 16</td>
</tr>
<tr>
<td>Display</td>
<td>8-character x 2-lines LCD (included)</td>
<td>2.8&quot; TFT Touch Shield (only included in the &quot;-V2&quot; product)</td>
<td>2.8&quot; TFT Touch Shield (separate add-on product)</td>
</tr>
</tbody>
</table>
Flash Programming Tools

PG-FP6 Programmer
- Supports 78K, RL78, V850 and RH850 flash microcontrollers
- For development, prototyping and production lines
- Graphical Windows user interface
- Host-controlled or stand-alone operation
- 256MB internal memory for up to eight program codes incl. setup data
- USB2.0 and RS-232 interface
- Order code: RTE0T00001FWREA000R

Renesas Flash Programming Software (RFP)
- Supports 78K, RL78, V850 and RH850 flash microcontrollers
- For development and prototyping
- Works with E2 debugger and direct RS-232/UART connection
- Graphical Windows user interface
- Support for automated programming using scripts
- Available for free at www.renesas.com/rfp
Flash Programming

On-line

Off-line (Stand-alone operation)

Note) PG-FP6 can be powered via USB port
3rd Party Flash Programmers

- Support of 3rd party programmer vendors for RH850 via dedicated department at Düsseldorf
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