RH850/F1K, RH850/F1KX
TOOL PRESENTATION

Automotive Business Unit
Renesas Electronics
04/2020  Rev. 2.0
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RH850/F1K, RH850/F1Kx – 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 IE850 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)

*: January 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 integration, E2 integration is under development
  - 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 (SW-license)
  - Y-IAR-EWRH850-FULL-MOBILE (Dongle-license, USB dongle included)

*: January 2020
Wind River Diab Compiler for RH850

- Powerful optimization engine in C compiler for RH850G3K(H)/G3M(H) and G4MH cores
- The latest industry standards:
  - Edison Design Group front end
  - Dinkumware libraries
  - ANSI/ISO C and C++ conformance
- Reliable quality
  - Tested with millions of test cases and industry standard test suites
  - POSIX PSE52 conformance
- Flexible business model:
  - Perpetual licenses for one architecture or annual per-developer subscription for all architectures
- No debug system included
  - Recommended to use iSYSTEM WinIDEA or Lauterbach TRACE32® Debugger system
- Current Version: 5.9.6.3*

*: September 2019
SmartConfigurator [SC-RH850-EE]

- Driver/Peripheral code generation by Graphical User interface
- Generate initial code for peripheral/port driver configuration
- Easy pin assignment/configuration
- Automatic plausibility checks avoid illegal configurations
- Generate pin assignment report
- Board configuration feature
- Free of charge
SmartConfigurator [SC-RH850-EE] - Screenshots
RH850/F1K, RH850/F1Kx – Emulator Tools
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
RH850/F1KM Emulation Adapter - Concept

- iSYSTEM IC5500
- Lauterbach TRACE32®

E2 Emulator

14-pin Debug Cable

14-pin to 38pin Adapter

RH850/F1KM EMU Device (with NEXUS TRACE I/F)

Exchange Adapter (EA)

Space adapter (YS)

ICE Connector (YQ)

Target connector (NQ)

N-Type connector

User Target system

Mandatory

Selectable Option

RH850/F1H or F1KM Emulation Adapter

or

Lauterbach TRACE32®
## RH850/F1KM Emulation Adapter - Part List

<table>
<thead>
<tr>
<th>Tool Component</th>
<th>RH850/F1KM Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>100-pin LQFP</td>
</tr>
<tr>
<td>Emulation Adapter</td>
<td>Y-RH850-F1KM-EMU-ADAPTER</td>
</tr>
<tr>
<td>YQ Connector</td>
<td>QB-100GC-YQ-01T</td>
</tr>
<tr>
<td>Target Connector</td>
<td>QB-100GC-NQ-01T</td>
</tr>
<tr>
<td>Space Adapter</td>
<td>QB-100GC-YS-01T</td>
</tr>
<tr>
<td>Mount Adapter</td>
<td>QB-100GC-HQ-01T</td>
</tr>
</tbody>
</table>
3rd Party Emulator Support

- Central support and coordination of 3rd party tool vendors via dedicated tool support department
- Complete information exchange including design information based on individual and mutual NDA between REE and 3rd party tool vendor
- 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
3rd Party Emulator Support pls

- Universal Debug Engine for debugging, trace and test
- Universal Access Devices UAD2pro, UAD2next and UAD3+
- Supported targets: RH850/F1x, F1Kx devices
- Support for common compiler platforms
- Software API for third party tools and test automation
- For more information visit [www.pls-mc.com](http://www.pls-mc.com)
RH850/F1K, RH850/F1Kx – Starter Kits
RH850/F1Kx Starter Kit Package

Package includes:

- RH850/F1x Starter Kit board
- E1 On-Chip Debugging Emulator
- Green Hills Multi - 90-Day Evaluation License
- IAR EWRH850 - 128K KickStart Edition
- Renesas CS+ - 256K Evaluation License
- iSYSTEM WinIDEA/E1 Evaluation License
- Renesas Flash Programming GUI (RFP)
- Renesas SmartConfigurator/Code Generator
- Start-up Project with Sample Software
- Quick Start Guide

Order codes:

- Y-ASK-RH850F1K-V3
- Y-ASK-RH850F1KM-S4-V3
- Y-ASK-RH850F1KM-S1-V3
- Y-ASK-RH850F1KH-D8-V3
# RH850/F1Kx Starter Kit – Solution Overview

<table>
<thead>
<tr>
<th>Product type</th>
<th>Y-ASK-RH850F1KM-S1-V3</th>
<th>Y-ASK-RH850F1K-V3</th>
<th>Y-ASK-RH850F1KM-S4-V3</th>
<th>Y-ASK-RH850F1KH-D8-V3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Features</td>
<td>RH850/F1KM [R7F701084]</td>
<td>RH850/F1K [R7F701587]</td>
<td>RH850/F1KM [R7F701649]</td>
<td>RH850/F1KH [R7F701709]</td>
</tr>
<tr>
<td></td>
<td>100pin</td>
<td>176pin</td>
<td>176pin</td>
<td>176pin</td>
</tr>
<tr>
<td>Picture</td>
<td><img src="image1" alt="Picture" /></td>
<td><img src="image2" alt="Picture" /></td>
<td><img src="image3" alt="Picture" /></td>
<td><img src="image4" alt="Picture" /></td>
</tr>
<tr>
<td>CAN(-FD)</td>
<td>2ch CAN(-FD)</td>
<td>2ch CAN(-FD)</td>
<td>2ch CAN(-FD)</td>
<td>2ch CAN(-FD)</td>
</tr>
<tr>
<td>FlexRay</td>
<td>-</td>
<td>-</td>
<td>1ch</td>
<td>1ch</td>
</tr>
<tr>
<td>Ethernet</td>
<td>-</td>
<td>-</td>
<td>1ch</td>
<td>1ch</td>
</tr>
<tr>
<td>Others</td>
<td>1ch LIN, 1ch RS232/UART</td>
<td>External Multiplexer for digital inputs of Low Power Sampler</td>
<td>Pin headers for direct access to every device pin</td>
<td>User interaction through potentiometer, rotary switch, buttons and LEDs</td>
</tr>
<tr>
<td>Board size:</td>
<td>142mm x 108mm</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
RH850/F1x, F1Kx Starter Kit - Start-up Project /Software

- Basic MCU Initialization / Operating System Timer
- PWM generation for user LEDs and RGB LEDs
- PWM Diagnostic Function for RGB LEDs
- A/D-Converter for PWM-Diagnostics and Potentiometers
- Stand-by modes including Low Power Sampler (LPS)
- Push-Button / Encoder Function
- CAN Frame Transmission
- LIN Frame Transmission
- UART + SPI Transmission
- Timer Array Unit [J + B]
- Ethernet Demo with Webserver Application (for RH850/F1H, RH850/F1KM-S4 and RH850/F1KH-D8 only)
RH850/F1KM-S1 Motor Control Starter Kit

Package includes:

- RH850/F1KM-S1 Starter Kit board including Motor control circuit (Predriver + B6-MOSFET-Bridge)
- E1 On-Chip Debugging Emulator
- BLDC Motor (with Hall Sensors)
- 12V Power Supply Unit
- Green Hills Multi - 90-Day Evaluation License
- IAR EWRH850 - 128K KickStart Edition
- Renesas CS+ Compiler - 256K Evaluation License
- Start-up Project with Sensorless Field-Oriented Control Sample Software
- Motor Control GUI
- Quick Start Guide

Order code:
- Y-BLDC-SK-RH850F1KM-S1
Online Resources – Documentation + Sample software


http://www.renesas.eu/updates?oc=Y-BLDC-SK-RH850F1KM-S1
RH850/F1K, RH850/F1Kx - Evaluation Boards
## Evaluation Platform – RH850/F1K, RH850/F1Kx Solution Overview

- Modular design, available for all package variants

<table>
<thead>
<tr>
<th>Supported Devices</th>
<th>RH850/F1K, F1Kx Series</th>
</tr>
</thead>
<tbody>
<tr>
<td>Board Type</td>
<td>48-pin</td>
</tr>
<tr>
<td>F1KM-S1</td>
<td>F1KM-S1</td>
</tr>
<tr>
<td>F1K</td>
<td>F1KM-S4</td>
</tr>
<tr>
<td>F1K</td>
<td>F1KM-S4</td>
</tr>
<tr>
<td>F1K</td>
<td>F1KM-S4</td>
</tr>
<tr>
<td>F1K</td>
<td>F1KM-S4</td>
</tr>
<tr>
<td>F1K</td>
<td>F1KM-S4</td>
</tr>
<tr>
<td>F1K</td>
<td>F1KM-S4</td>
</tr>
<tr>
<td>Piggyback board (supports stand-alone operation)</td>
<td>Y-RH850-F1X-048PIN-PB-T1-V1</td>
</tr>
<tr>
<td>Main board (adds additional functionality, e.g. physical I/F for CAN, LIN, Ethernet, and FlexRay)</td>
<td>Y-RH850-X1X-MB-T1-V1</td>
</tr>
</tbody>
</table>
Evaluation Platform – Outline Spec MCU Piggyback Board

- Burn-In Socket adapter for MCU target connection
  - Either from YAMAICHI or Enplas
- Stand-alone operation option
  - direct supply for device (typ. 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
- External clock circuits
  - with an exchangeable 8/16 MHz Crystal Resonator
- Reset button
- All I/O pins are directly accessible
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)
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</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</td>
<td>2ch</td>
</tr>
<tr>
<td></td>
<td>(selectable between RJ45 or BroadR-Reach®)</td>
<td>(I/F connector for exchangeable PHY Extension boards, add-on product)</td>
<td></td>
</tr>
<tr>
<td>SENT</td>
<td>-</td>
<td>-</td>
<td>2ch</td>
</tr>
<tr>
<td></td>
<td>(I/F connector to connect SENT Sensor boards, add-on product)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PSI5/PSI5S</td>
<td>-</td>
<td>-</td>
<td>2ch</td>
</tr>
<tr>
<td></td>
<td>(supported by I/F connector)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>eMMC/SFMA</td>
<td>-</td>
<td>-</td>
<td>supported</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(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 “-V2” product)</td>
<td>2.8&quot; TFT Touch Shield (separate add-on product)</td>
</tr>
</tbody>
</table>
RH850/F1K, RH850/F1Kx - Flash Programming Tools
Flash Programming Tools

PG-FP6 Programmer
- Supports RL78 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 RL78 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**

- RS-232
- Level Shifter
- USB
- PG-FP6

**Off-line (Stand-alone operation)**

- AC adapter
- GND cable
- Target cable

Note: PG-FP6 can be powered via USB port

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3rd Party Flash Programmers

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

- Complete information exchange including design information based on individual and mutual NDA between REE and 3rd party programmer vendor

- Central support and coordination from Düsseldorf location.

- Device samples and target hardware provided by Renesas.