RL78/L1C

Utilising the USB PHID for e² studio

R01AN2313EG0100
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Introduction

This sample demonstrates the use of the RL78/L1C as a USB Peripheral HID. It can be configured as an HID Keyboard, HID Mouse or in HID demo mode.

Target Device

RL78/L1C

Development environment

IDE: e^2 studio
Compiler: GNURL78 v13.02 -ELF
Hardware: Renesas Starter Kit for RL78/L1C

Contents

1. Installation

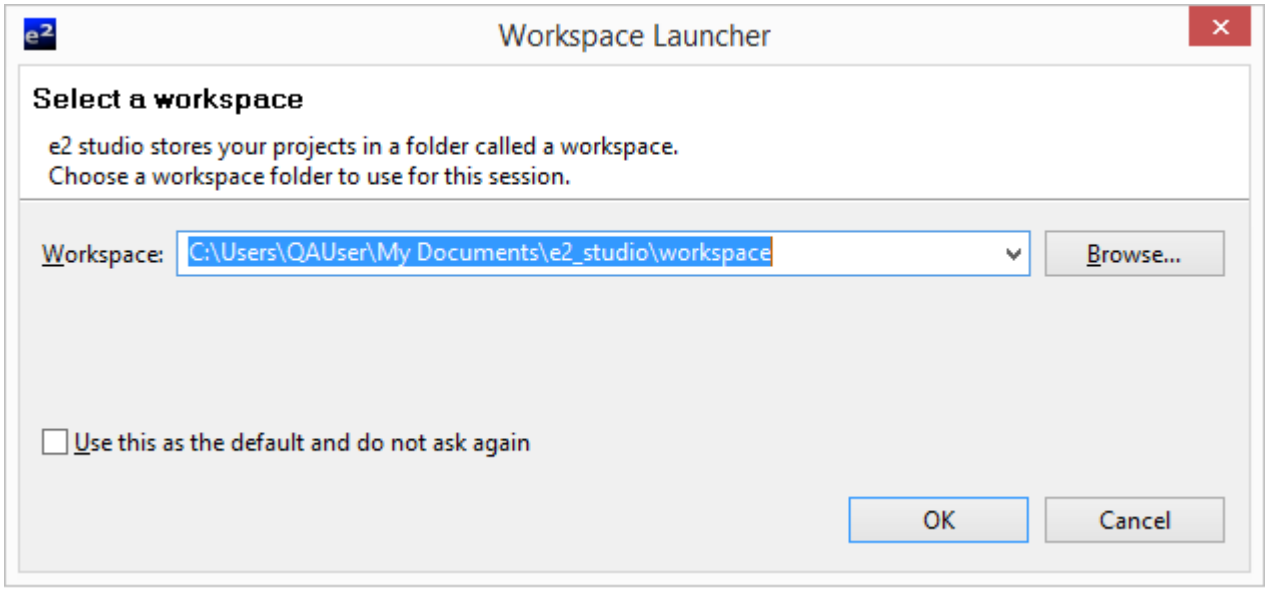
This section assumes e^2 studio IDE is already installed on the user's personal computer (PC). It is also assumed that the following software and versions are installed:

- Renesas e^2 studio Version 2.02.00.13 or later
- Application Leading Tool for RL78 Version 1.01.00.02
- GNURL78 Version 13.02-ELF

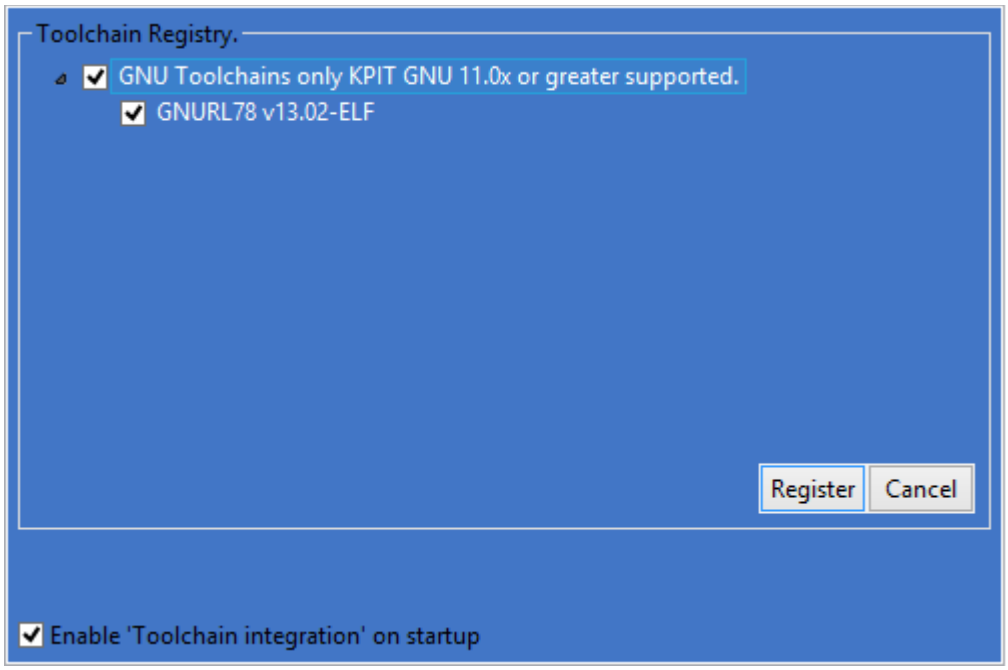
Create a new folder and name it as 'RSKRL78L1C_Workspace'. Copy the zipped file 'an_r01an2125eg0100_rl78l1c_usb_phid.zip', available in the Application Note package downloaded from the website, to this folder. Extract the 'an_r01an2125eg0100_rl78l1c_usb_phid.zip' file to the 'RSKRL78L1C_Workspace' folder.

2. Creating the Project Workspace

Open e^2 studio IDE by clicking the Windows Start button, select All Programs > Renesas Electronics e2 studio > Renesas e2 studio.

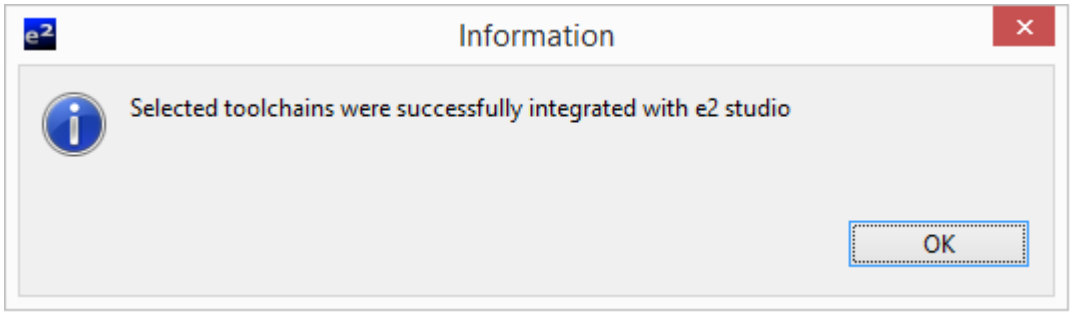


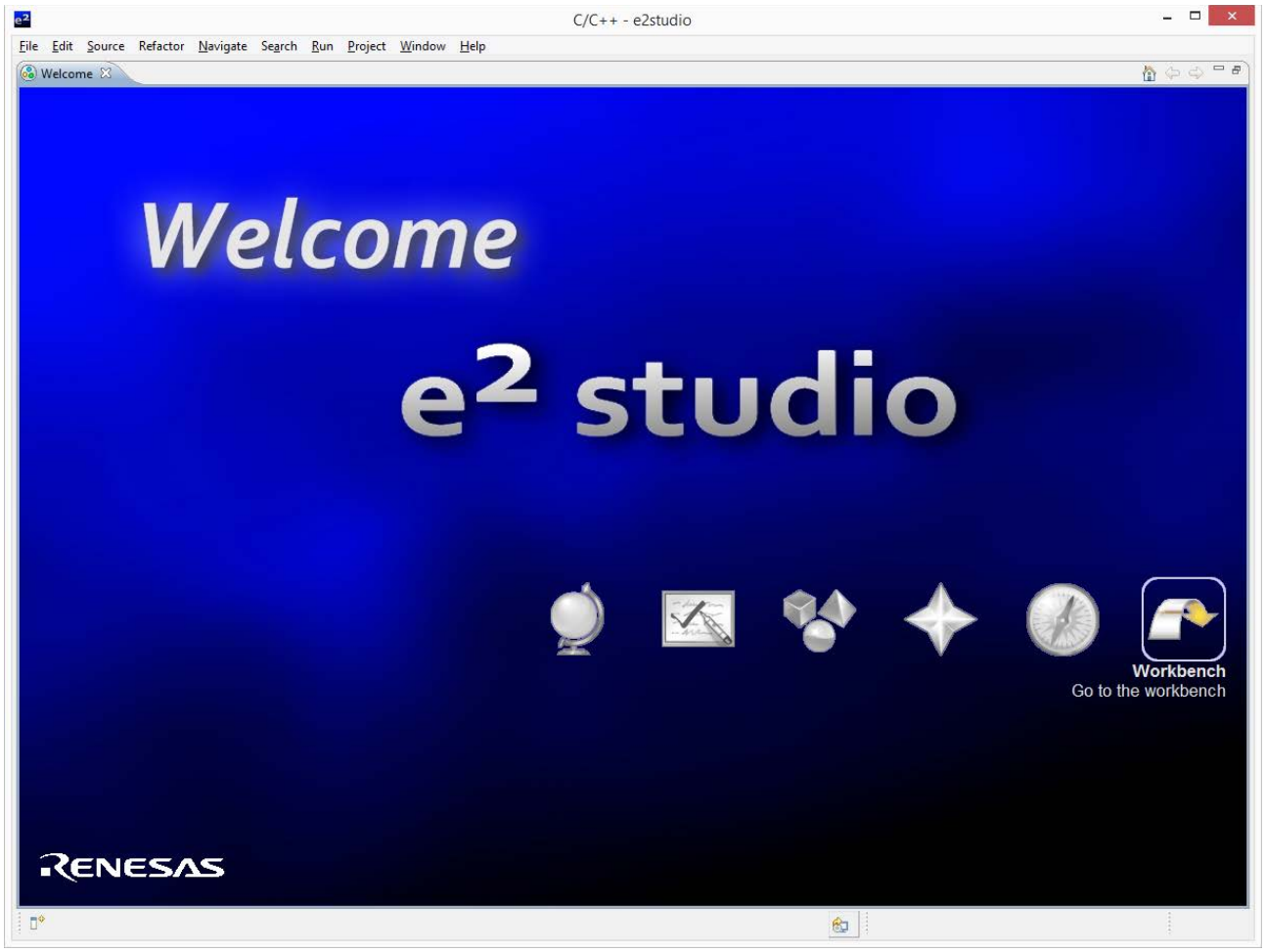
Select <OK>



Select ‘GNU Toolchains only…’ and ‘GNURL78 v13.02-ELF’ checkboxes. Click ‘Register’. A dialog will appear Click <OK>.

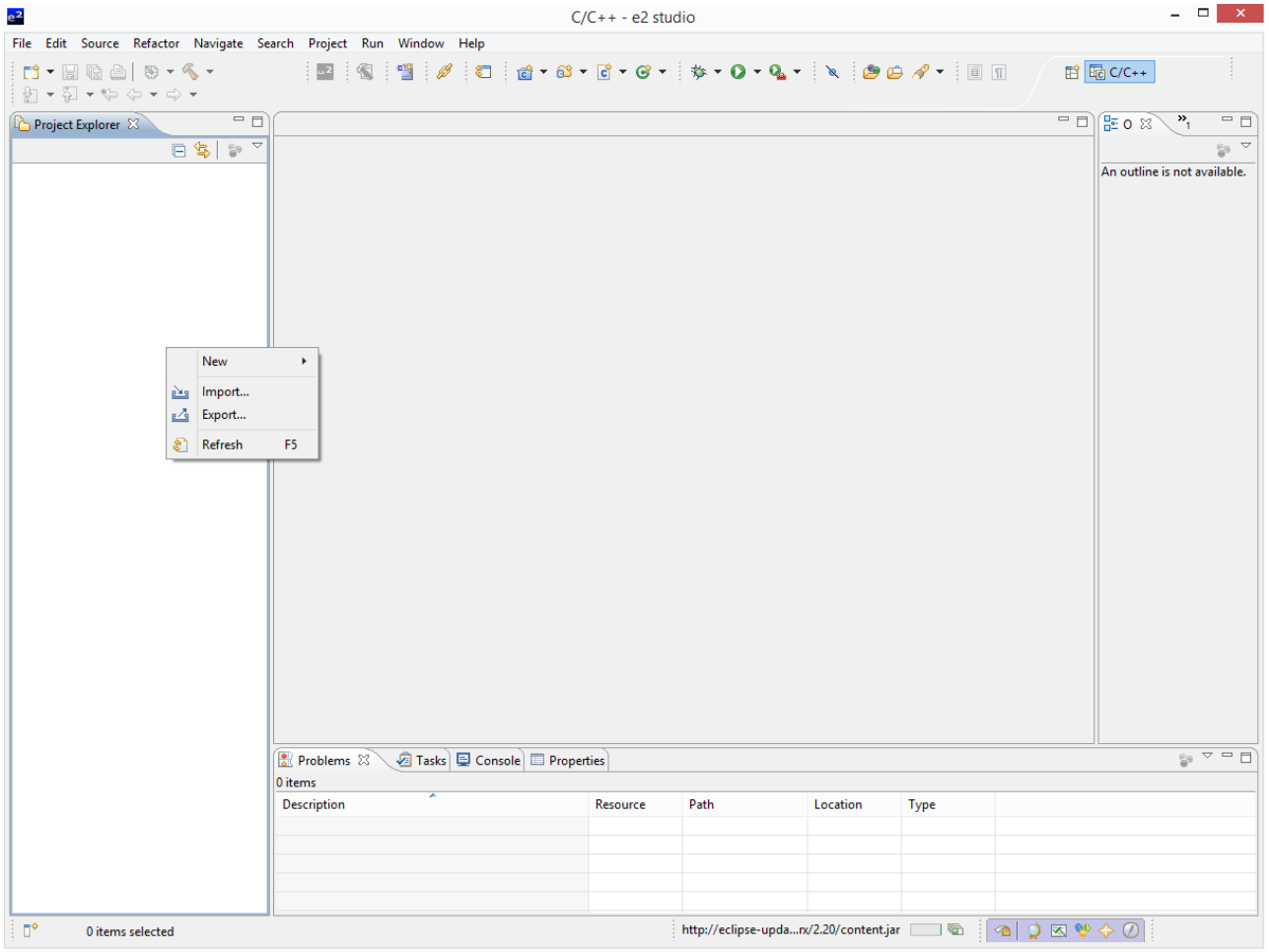
“Selected Toolchains were successfully integrated with e2studio”. Click <OK>.



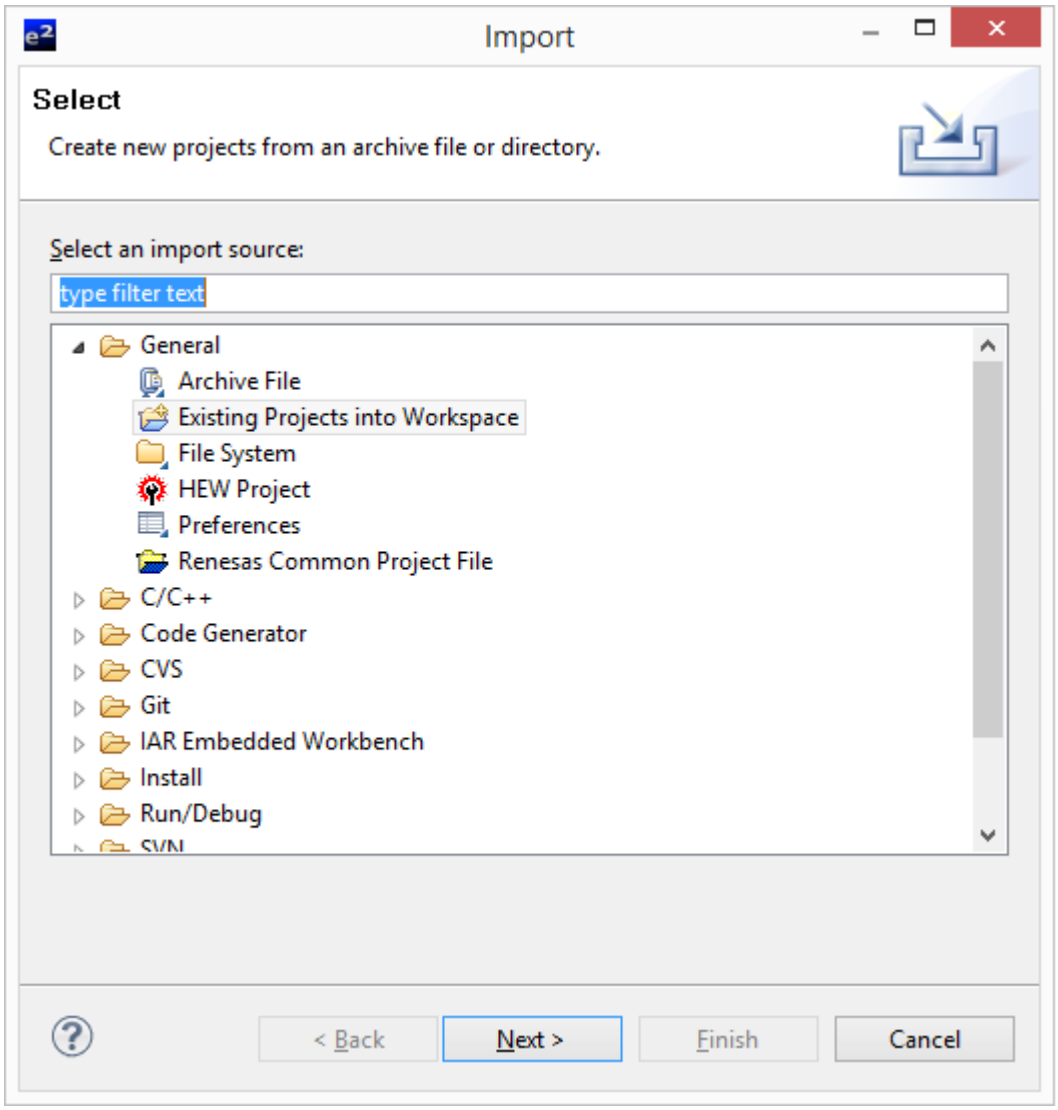

C/C++ - e2studio
File Edit Source Refactor Navigate Search Run Project Window Help
Welcome
Welcome
e² studio
Workbench
Go to the workbench
RENESAS

On the welcome screen, select ‘Go to the Workbench’ icon as shown above.

1. Once the e^2 studio environment has initialised, right click in the project explorer window and click <Import…>



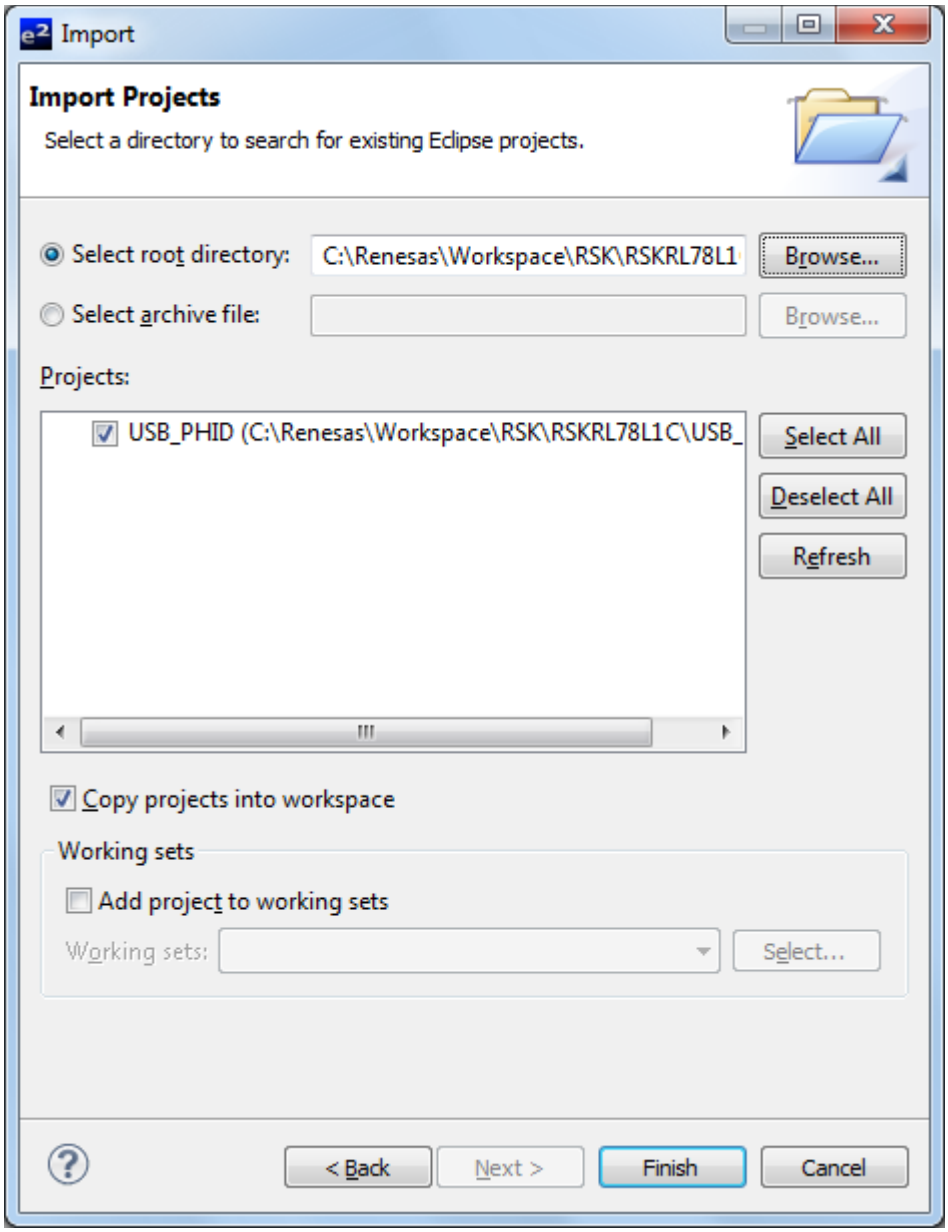
2. The Import dialog will now appear. Expand the “General” folder icon, and select “Existing Projects into Workspace”, then click ‘Next’.



3. The Import Dialog will now appear and specify the project to import. Click the “Browse” button and locate the directory created in section 1: ‘RSKRL78L1C_Workspace’.

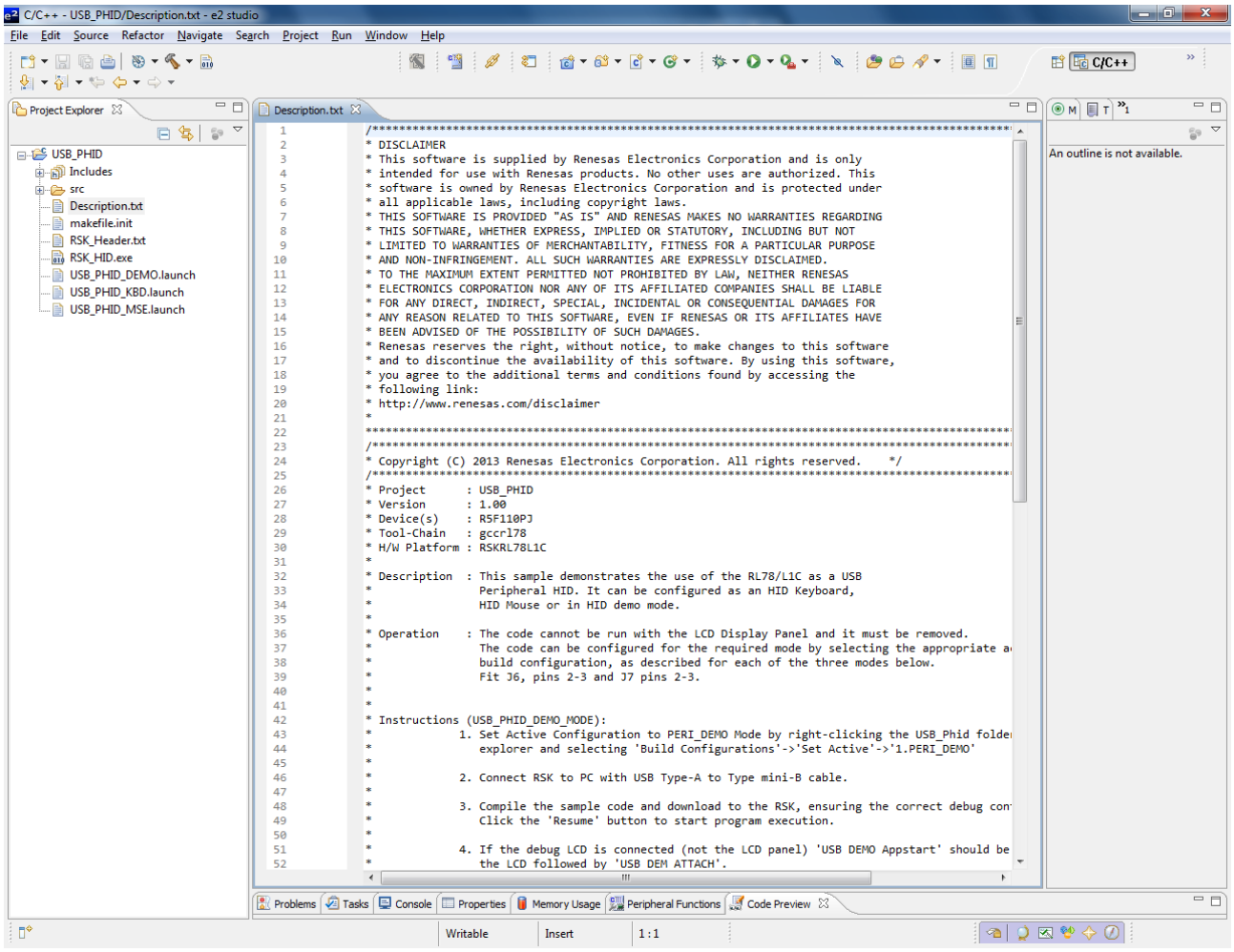
   Also ensure that the ‘Copy projects into workspace’ option is ticked, and then click <Finish>

   The IDE e^2 studio will load the project.


Import
Import Projects
Select a directory to search for existing Eclipse projects.
Select root directory:
C:\Renesas\Workspace\RSK\RSKRL78L1
Browse...
Select archive file:
Browse...
Projects:
USB_PHID (C:\Renesas\Workspace\RSK\RSKRL78L1C\USB_
Select All
Deselect All
Refresh
Copy projects into workspace
Working sets
Add project to working sets
Working sets:
Select...
< Back
Next >
Finish
Cancel

3. Opening Sample Code and Source

Once the project has been opened, the source code and all dependent files can be opened in the editor by expanding the folders in the Project Tree window and double clicking the files listed. All files have been grouped according to their file type.



4. Source Code Functionality

The source code project is specifically written to run on the appropriate RSK. However, this source code can be useful as an example even without the RSK.

The project was written using source files containing API functions generated using Code Generator. The project will contain a C source file ‘r_cg_main.c’. This source file includes the C function main(). All source files and dependent files whose filenames are prefixed with ‘r_cg_’ were generated using Applilet4 (Application Leading Tool). For more information, refer to Description.txt.

5. Appendix

Example of comment block with code functionality.

```
/*****************************************************************************************************
* Project      : USB_PHID
* Version      : 1.00
* Device(s)    : R5F110PJ
* Tool-Chain   : gccrl78
* H/W Platform : RSKRL78L1C
*
* Description  : This sample demonstrates the use of the RL78/L1C as a USB
*              Peripheral HID. It can be configured as an HID Keyboard,
*              HID Mouse or in HID demo mode.
*
* Operation    : The code cannot be run with the LCD Display Panel and it must be removed.
*              The code can be configured for the required mode by selecting the appropriate active
*              build configuration, as described for each of the three modes below.
*              Fit J6, pins 2-3 and J7 pins 2-3.
*
*
* Instructions (USB_PHID_DEMO_MODE):
*          1. Set Active Configuration to PERI_DEMO Mode by right-clicking the USB_Phid folder icon in the project
*             explorer and selecting 'Build Configurations'->'Set Active'->'1.PERI_DEMO'
*
*          2. Connect RSK to PC with USB Type-A to Type mini-B cable.
*
*          3. Compile the sample code and download to the RSK, ensuring the correct debug configuration is selected.
*             Click the 'Resume' button to start program execution.
*
*          4. If the debug LCD is connected (not the LCD panel) 'USB DEMO Appstart' should be displayed on
*             the LCD followed by 'USB DEM ATTACH'.
*
*          5. Launch the RSK_HID.exe application. Click the 'Connect' button and use VID = 0x0000
*             and PID = 0x0003.  The application should display a message indicating a successful
*             connection to the RSK.
*
*          6. Use the 'Toggle LED', 'ReadADC' and 'Set LCD' buttons on the RSK_HID.exe application to
*             interact with the device.
*
```

```
* Instructions (USB_PHID_KEYBOARD_MODE):
*       1. Set Active Configuration to PERI_KBD Mode by right-clicking the USB_Phid folder icon in the project
*          explorer and selecting 'Build Configurations'->'Set Active'->'2.PERI_KBD'
*
*       2. Connect RSK to PC with USB Type-A to Type mini-B cable.
*
*       3. Compile the sample code and download to the RSK, ensuring the correct debug configuration is selected.
*          Click the 'Resume' button to start program execution.
*
*       4. If the debug LCD is connected (not the LCD panel) 'USB KBD Appstart' should be displayed on
*          the LCD followed by 'USB KBD ATTACH'.
*
*       5. Launch the Windows Notepad application or any simple text editor. Pressing SW2 should
*          result in the program sending HID reports for characters 'a' to 'z' when pressed repeatedly.
*          Pressing SW3 should result in the program sending HID reports for numbers  '1' to '0' when
*          pressed repeatedly.
*
* Instructions (USB_PHID_MOUSE_MODE):
*       1. Set Active Configuration to PERI_MSE Mode by right-clicking the USB_Phid folder icon in the project
*          explorer and selecting 'Build Configurations'->'Set Active'->'3.PERI_MSE'
*
*       2. Connect RSK to PC with USB Type-A to Type mini-B cable.
*
*       3. Compile the sample code and download to the RSK, ensuring the correct debug configuration is selected.
*          Click the 'Resume' button to start program execution.
*
*       4. If the debug LCD is connected (not the LCD panel) 'USB MSE Appstart' should be displayed on
*          the LCD followed by 'USB MSE SW0'.
*
*       5. Use RSK SW2 to move the Windows mouse pointer up/down and SW3 to move it left/right.
*          Use SW1 for left mouse button click.
*
* Reference:
*               Refer to the application notes r01an0326ej0211.pdf "Renesas USB MCU USB Basic Firmware Mini"
*               and r01an0546ej0211.pdf "USB Peripheral Human Interface Device Class Driver (PHID)
*               for Basic Firmware mini".
*
***********************************************************************************************/
```

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Revision History

		Description	
Rev.	**Date**	**Page**	**Summary**
1.0	Sep 11, 2014	-	First edition issued

General Precautions in the Handling of MPU/MCU Products

The following usage notes are applicable to all MPU/MCU 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 an MPU or MCU 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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Renesas Electronics America Inc.
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
1101 Nicholson Road, Newmarket, Ontario L3Y 9C3, Canada
Tel: +1-905-898-5441, Fax: +1-905-898-3220

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 1601-1613, 16/F., Tower 2, Grand Century Place, 193 Prince Edward Road West, Mongkok, Kowloon, Hong Kong
Tel: +852-2265-6688, Fax: +852 2886-9022/9044

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 906, 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 Korea Co., Ltd.
12F., 234 Teheran-ro, Gangnam-Ku, Seoul, 135-920, Korea
Tel: +82-2-558-3737, Fax: +82-2-558-5141

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